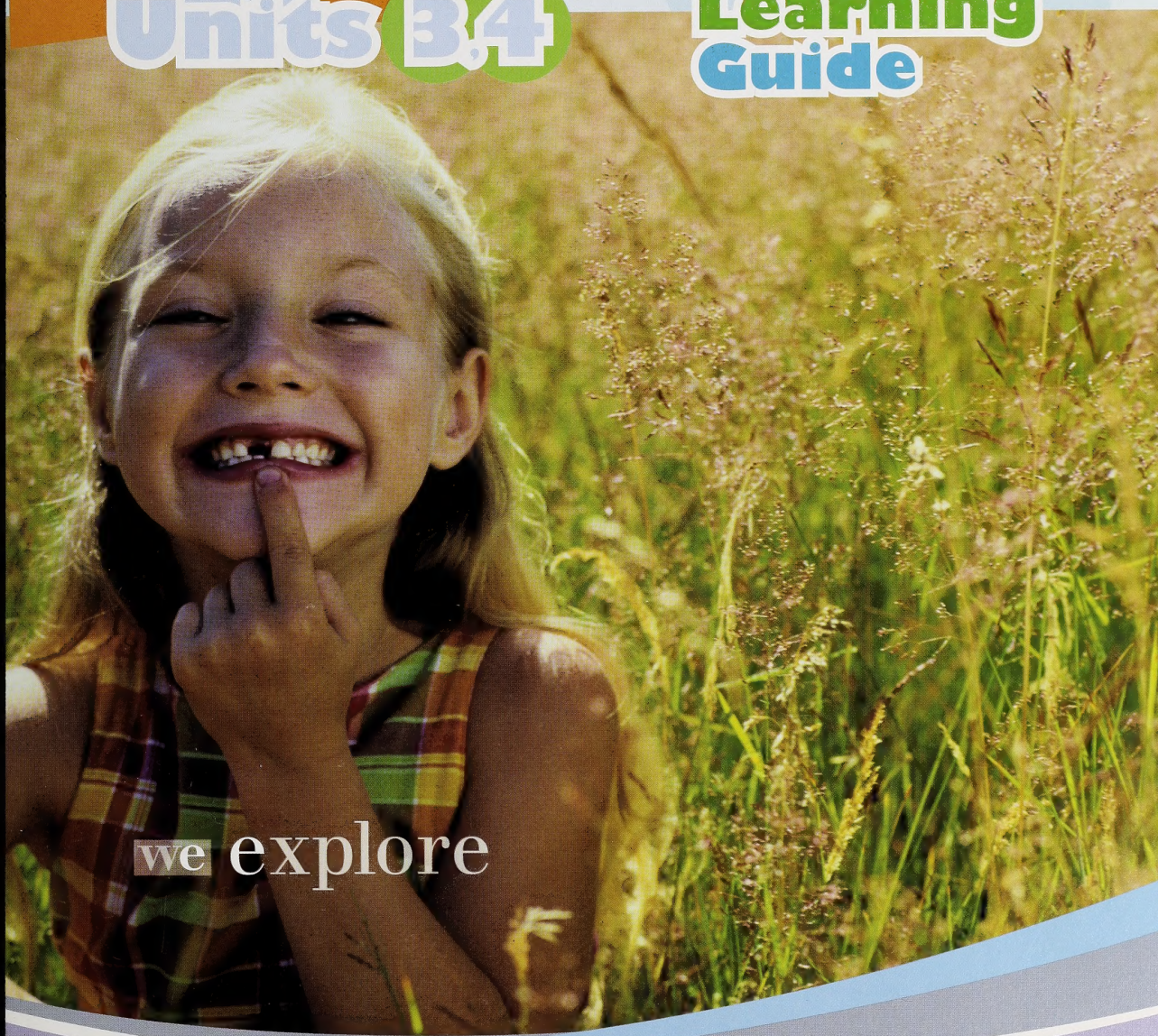
LearnEveryWare

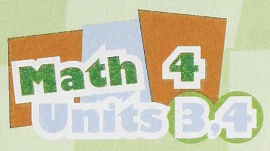
Math 4 Units B.4

Student Learning Guide



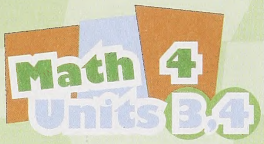
pilot®

Alberta Education



Math 4 Learn EveryWare – Units 3 and 4 Student Learning Guide
ISBN: 978-0-7741-3062-2

Math 4 Learn EveryWare has been developed under the terms of an agreement with Etraffic Press® and Alberta Education – Distributed Learning Resources Branch.



Creator
Wayne Poncia

Author
Michelle Gainer

Contributing Authors
Grant Mellemstrand
Lisa Read
Nancy Claire Duchaine

Senior Editor
Dr. Mary Ellen Bafumo

Editor
Mary Dillon

Project Manager
Lara Fisher

Production Manager
Sandi van Katwijk

Print Design Coordinator
Carrie Burke

Animators
Rob Jones
Stephen McCallum

Multimedia Designer
Troy Lemberg

Senior Developer
Jenny van Hoof

Publisher K - 12
Dr. Barry Carbol

Publisher Professional Development
Dr. Elizabeth Childs

Math Editors
Harvey Knapp
Wayne Loutet

Proofreader
Leelan Stanjek

Assistant Project Coordinator
Julia Schenck

Product Coordinator
Robert Bailey

Production Designers
Francisco Cumayas
Jacqueline Rimmer
Liviu Peicu
Sherif Sidky

Flash Developers
Harry Kim
Ryan Thomson

Illustrator
Ingrid Mesquita

Etraffic Press® would like to acknowledge the production and project teams of Etraffic Solutions™ Inc. and The Distributed Learning Resources Branch for their contributions to the project management, design, editing and development of this publication.

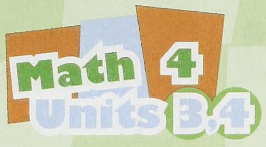
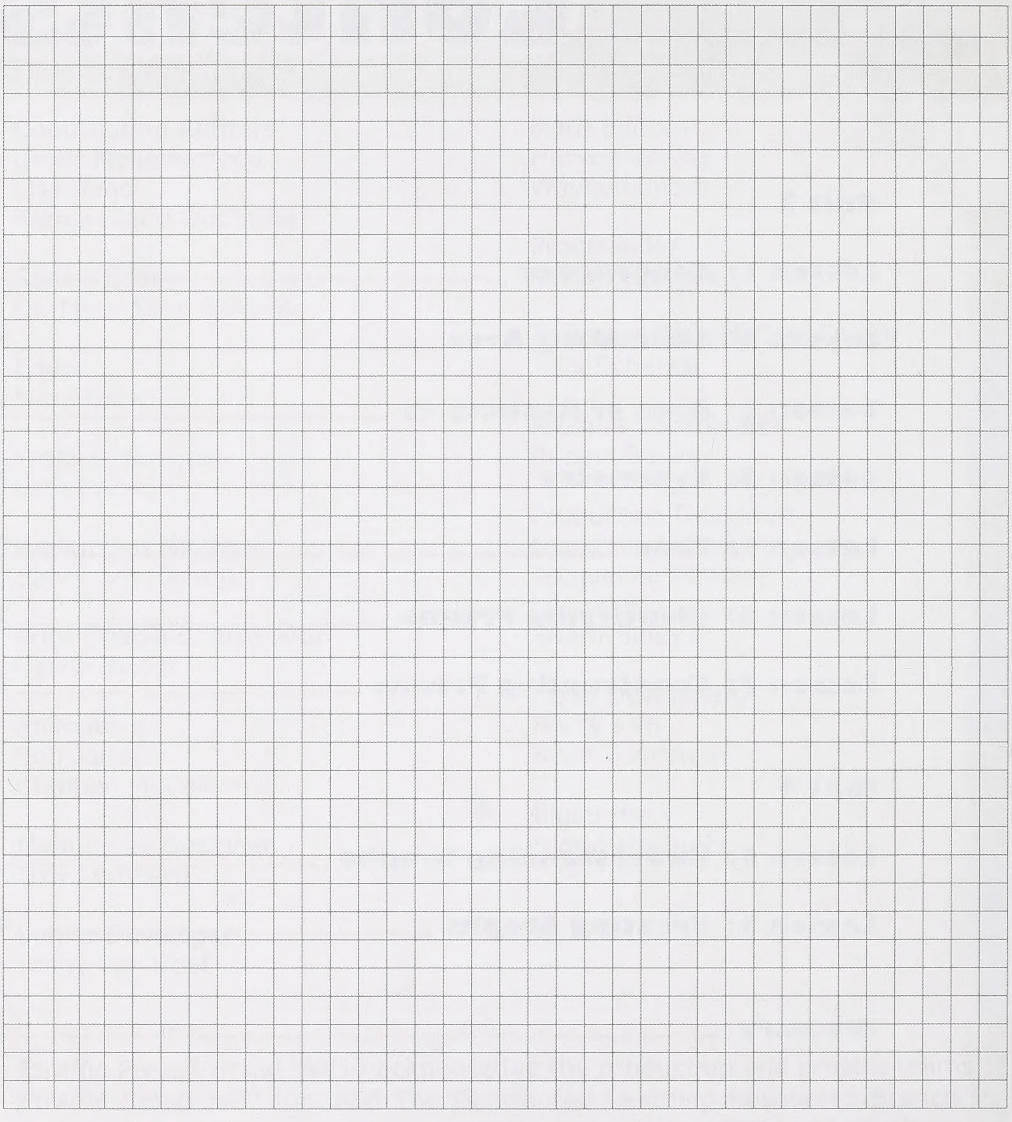


Table of Contents



Math 4 Unit 3

Lesson 1

Congruence

Manufacturing

When a toy company makes its toys they can use a mould. This method makes the toys all one size and shape.

Figures that are the same size and shape are **congruent**. In this lesson you will identify and compare congruent shapes.

Reflection

Can you think of any other congruent objects?

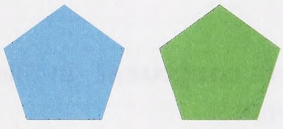
Objectives for this Lesson

In this lesson you will explore the following concepts:

- Define congruence
- Determine if two given 2-D shapes are congruent
- Create a shape that is congruent to a given 2-D shape
- Identify corresponding vertices and sides of two given congruent shapes

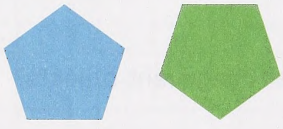
Congruent Shapes

When shapes are congruent they have the same size and shape. They can be different in colour and pattern.



The shapes above are congruent. They have the same size and shape but different colour.

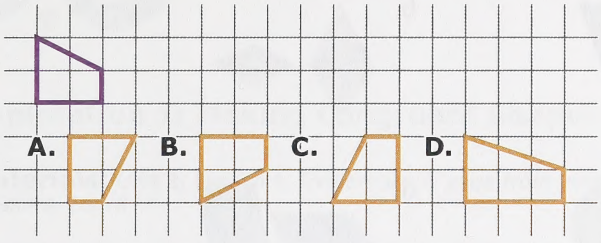
What if you take the second shape and turn it?



They are still the same size and shape. Placement of the figures does not change congruence.

Example 1

Which of the following is NOT congruent to the figure shown?



Choice A: The original figure has been turned to the side.
It is congruent.

Choice B: The original figure has been flipped upside down.
It is congruent.

Choice C: The original figure has been flipped to the right.
It is congruent.

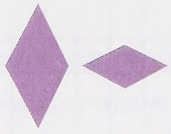
Choice D: The bottom is 3 units wide instead of 2.
It is not congruent.

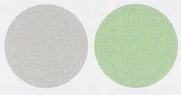
Choice D is NOT congruent to the blue shape.

Example 2

Are the following pairs of shapes congruent?

a. 

b. 

c. 

d. 

a. These shapes are different in colour but are the same in size and shape. Yes, they are congruent.

b. These shapes are different in size but are the same in shape. No, they are not congruent.

c. These circles are the same in size and shape but different in colour. Yes, they are congruent.

d. These shapes are the same in shape but are different in size. No, they are not congruent.

Exploration 1: Making Congruent Shapes

Materials: Unit 3, Lesson 1, Exploration 1 page from your Workbook, Construction paper, Scissors, Pencil

1. Fold your construction paper in half. Fold the paper in half again.
2. Draw a simple shape on the top of your folded paper.
3. Cut the outside lines of your shape.
4. You should now have 4 congruent shapes.
5. What makes your shapes congruent?
6. Repeat the process to make another set of congruent shapes.

Now It's Your Turn

Are the shapes congruent?

a. 

b. 

c. 

Solutions

a. No b. No c. Yes

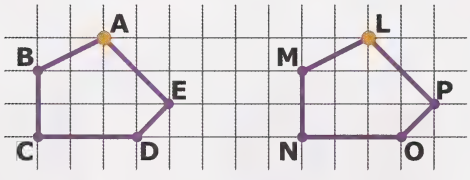
Let's Practice

- Turn in your Workbook to Unit 3, Lesson 1 and complete 1 to 6.

Go online to complete the Concept Capsule about Parts of 2-D Shapes.

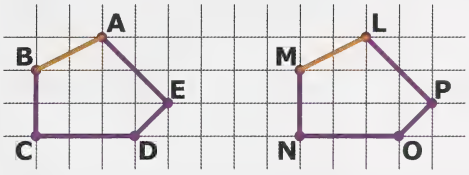
Matching Parts

You can match and describe congruent shapes by identifying parts. If the shapes are congruent then they have **corresponding parts**.



In this picture the **vertices** of the shapes are labelled. The point **A** corresponds to the point **L** in the congruent shape. They are in the same position of the figure.

You can also find corresponding sides in a pair of congruent shapes. The segment from **A** to **B** corresponds to the segment from **L** to **M**. They are in the same position.



The side **LM** corresponds to the side **AB**.

The side **CD** corresponds to the side **NO**.

The vertex **E** corresponds to the vertex **P**.

The vertex **B** corresponds to the vertex **M**.

Example 3

Complete the statements given the congruent shapes.

A. Vertex **M** corresponds to vertex _____.

The answer is: J

B. Vertex **R** corresponds to vertex _____.

The answer is: Y

C. Side **MN** is congruent to side _____.

The answer is: JZ

You should write your answer so that corresponding vertices are listed in the same order. In this case **M** corresponds to **J**, and **N** corresponds to **Z**.

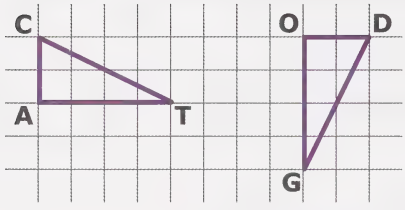
D. Side **TM** is congruent to side _____.

The answer is: **KJ**

E. Side **NR** is congruent to side _____.

The answer is: **ZY**

You may find that it is not always so easy to find the congruent parts. Congruent figures, such as the following, may be in different positions.

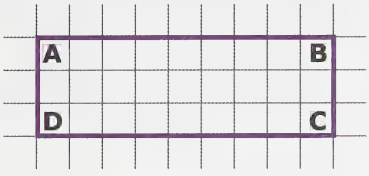


In this case you must look closely at how the shape is positioned. To find corresponding parts, look for similarities.

Exploration 2: Changing Positions

Materials: Unit 3, Lesson 1, Exploration 2 page from your Workbook, 2 sheets of grid paper, from the back of this Unit in your Workbook, Scissors, Pencil

1. Draw a rectangle on the first sheet of grid paper. Label the inside corners of the rectangle **A**, **B**, **C**, **D**, like this:



2. Draw a triangle on the first sheet of grid paper. Label the inside corners **E**, **F**, **G**.

3. Draw your own shape on the grid paper. Make sure that each vertex of your shape is on a place where the gridlines cross. Label the inside corners.

4. Cut out your 3 shapes.

5. On the other sheet of grid paper trace the rectangle and label the corners that you traced.

6. TURN the rectangle and trace it in another position on the grid paper. Label the corners with letters you haven't used yet.

7. Complete the following:

   A corresponds to _____. **B** corresponds to _____.

   C corresponds to _____. **D** corresponds to _____.

8. Repeat the process from numbers 5 and 6 with your triangle.

9. Complete the following for your triangle:

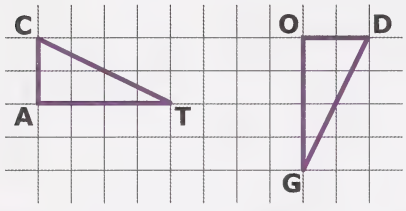
   E corresponds to _____. **F** corresponds to _____.

   G corresponds to _____.

10. Repeat the process from numbers 5 and 6 with your shape.
11. Create statements that tell the vertices that correspond for your shape.
12. Reflect: How does moving the shape across the grid paper help you find corresponding parts?

Example 4

Find the corresponding sides and vertices in the congruent figures:



C corresponds to _____.

A corresponds to _____.

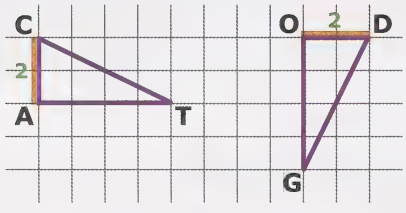
T corresponds to _____.

CA is congruent to _____.

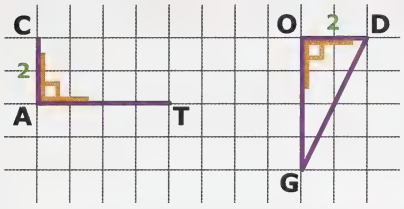
AT corresponds to _____.

CT corresponds to _____.

The side labelled **CA** is 2 units long on the graph paper. The side labelled **DO** is also 2 units long.

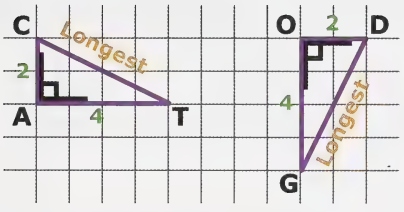


The vertex labelled **A** is on a right angle and so is the vertex labelled **O**.



The side labelled **AT** is 4 units long and the side labelled **OG** is also 4 units long.

The side labelled **TC** is the longest side and the side labelled **DG** is also the longest side.



Use these observations to complete the statements:

C corresponds to D.

A corresponds to O.

T corresponds to G.

CA is congruent to DO.

AT corresponds to OG.

CT corresponds to DG.

Reflection

What if the original shape is a square? How would that change finding the vertices that correspond?

Let's Practice

- In your Workbook go to Unit 3, Lesson 1 and complete 7 to 9.

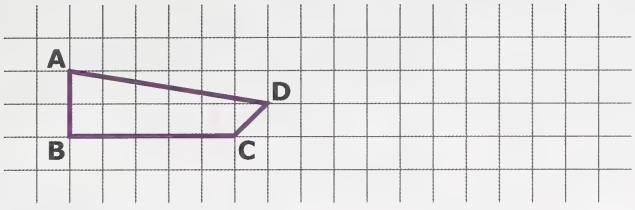
Drawing Congruent Figures

A good way to draw congruent figures is to use grid paper. You can use the grid paper to draw figures with more accuracy.

Example 5

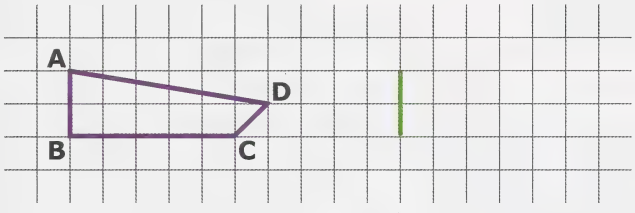
Daksha has a garden that is shaped like this one. Cameron wants his garden to be congruent to Daksha's.

Draw the shape that is congruent to the given shape.

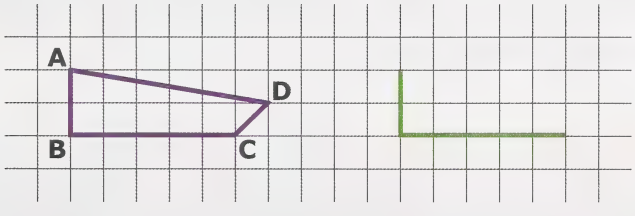


There are several ways to approach this problem. One is shown here.

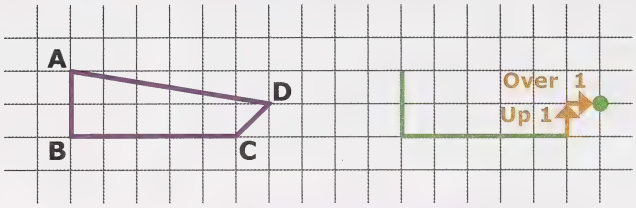
Draw the side that corresponds to **AB**. It is vertical and measures 2 units:



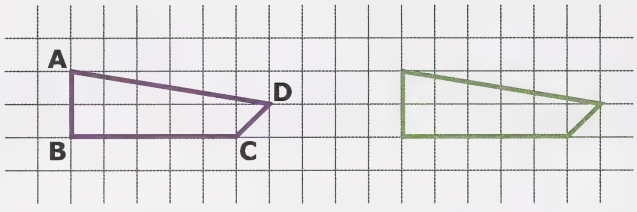
The side labelled **BC** is 5 units and is horizontal:



The vertex **D** is one up then one right of the vertex **C**. Use that to position the last vertex of your figure:



Now draw in the sides that correspond to **AD** and **CD**:



You are done!

You can create a congruent shape in many ways. You may want to place all vertices first and then draw the sides. You may want to draw the sides and vertices at the same time. Make sure your final figure matches the size and shape of the original figure.

- In your Workbook go to Unit 3, Lesson 1 and complete 10 to 13.

Lesson 2

Estimating Area

Pond Skating

Nina has a pond that she likes to skate on in the winter.
The pond looks like this:

Alyssa skates at the rink near her home. The rink looks like this:

Nina estimates that the area of both the pond and the rink are the same.

Reflection

Can you estimate area?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- Identify the best shape for measuring area
- Determine the area of a shape
- Estimate the area of a shape
- Identify the best measure for a given area

What is Area?

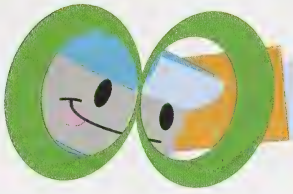
Area should not be confused with **perimeter**. You have already worked with perimeter. The perimeter is the distance around an object.
You measure perimeter with units like these:

metres centimetres

These are all measures that are **linear**. That means they are measured in a straight line. You probably used a ruler to measure, and it is in a straight line.

When you measure **area**, you are not looking for a linear measure. One way to think of area is the amount of ice Nina needs to cover her pond. You first need to practice covering shapes.

Let's explore! Use the following exploration to find the best shape possible for measuring area.



Let's Explore

Exploration 1: Estimating Area

Materials: Unit 3, Lesson 2, Exploration 1 page from your Workbook, Exploration 1 pages from the back of this Unit in your Workbook, Dry lima beans, Pencil, Paper, Scissors

Cut-out the squares and rectangles from the pages labelled Exploration 1, at the back of this Unit in your Workbook. Pull out the pages with Figures 1 to 5 on them. You don't need to cut out those five figures. Keep your squares when you are done, because you will use them again in another lesson.

Procedures:

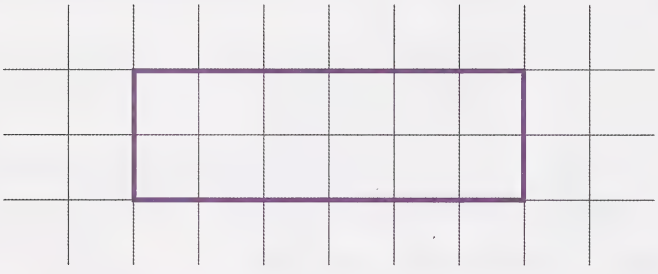
1. Use your dry beans to cover the figures.
2. Record the number of beans that cover each figure.
3. Use the circle cut-outs to cover each figure.
4. Record the number of circles that cover each figure.
5. Use the rectangle cut-outs to cover each figure.
6. Record the number of rectangles that cover each figure.
7. Use the square cut-outs to cover each figure.
8. Record the number of squares that cover each figure.
9. Reflect: Which shape (bean, circle, rectangle or square) do you think is the best to cover each figure? Why?

In this Exploration you should have noticed three things about measuring area:

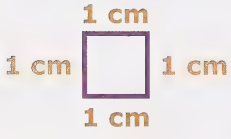
1. It is best to use squares to measure figures with straight edges.
2. Objects that leave holes when side by side do not cover.
3. The area is the number of a given object that covers the figure.

Grid Paper Measurements

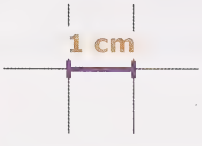
When you measure perimeter you look for the distance around the figure. You may have used grid paper to measure figures. This figure is on centimetre grid paper:



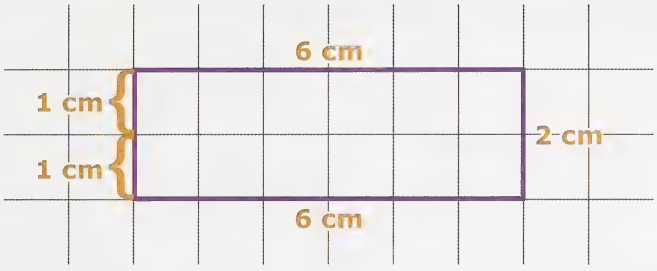
The perimeter of the rectangle shown is 16 centimetres. Each square has sides that are 1 centimetre:



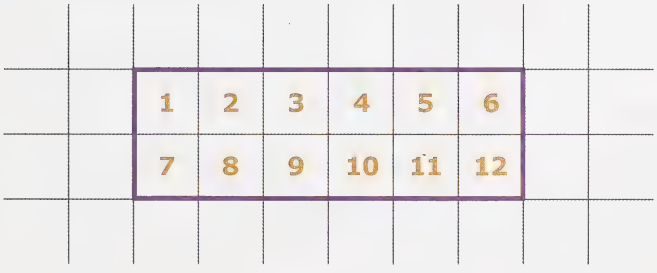
The perimeter is measured with a length of the side of a square:



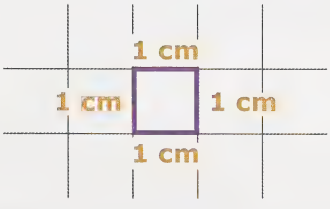
The perimeter is found by counting the sides of the squares that run along each side:



The area is found by counting the number of squares that fill up or cover the figure:



The measure is 12 square centimetres.
This is measured in unit squares like this:



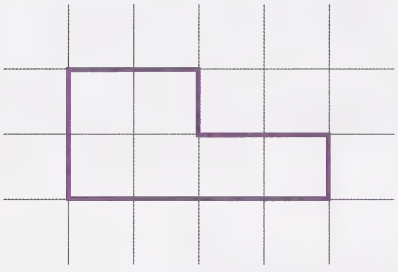
This is called a **centimetre square**.
When you fill up an object with these you have found the object's measure in square centimetres.

Determining Area

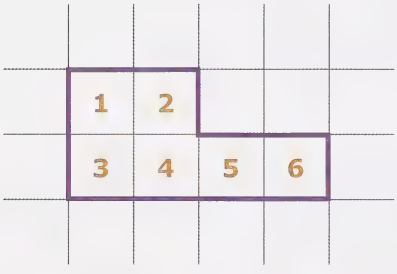
You can use centimetre grid paper to determine the area of figures. Simply count the squares that fill or cover the figure.

Example 1

Find the area of the given figure.



Count the squares.



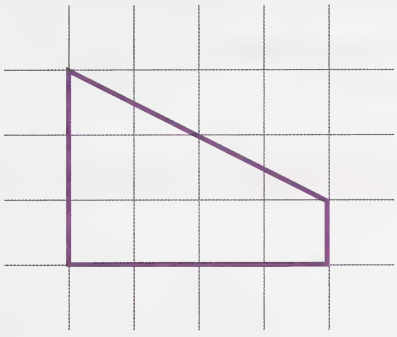
The area is: 6 square centimetres

Estimating Area

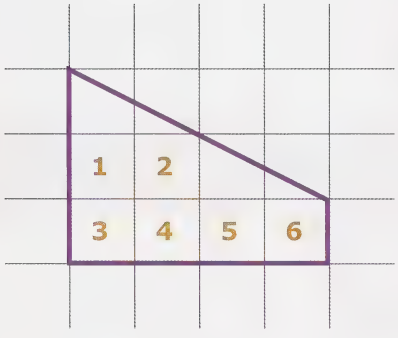
Some figures have odd shapes like those in your exploration. You can use grid paper to estimate the area of these shapes.

Example 2

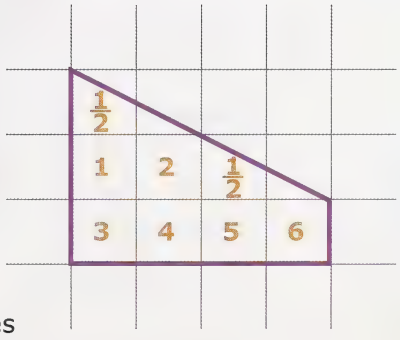
Estimate the area of the figure using centimetre grid paper.



1. Count the squares that are whole.



2. Count the squares that are larger than half a square. They should be counted as $\frac{1}{2}$ each.



3. Add up the numbers:

   $6 + \frac{1}{2} + \frac{1}{2} = 7$

4. The estimate is: about 7 square centimetres

There are other ways to estimate the same area. Estimates are not always exact answers.

Reflection

Can you think of other ways to estimate the answer to Example 2?

Let's explore! One way you can make estimates of area is to know the area of your hand. Find the area of your hand so that you can make good estimates.

Let's Explore

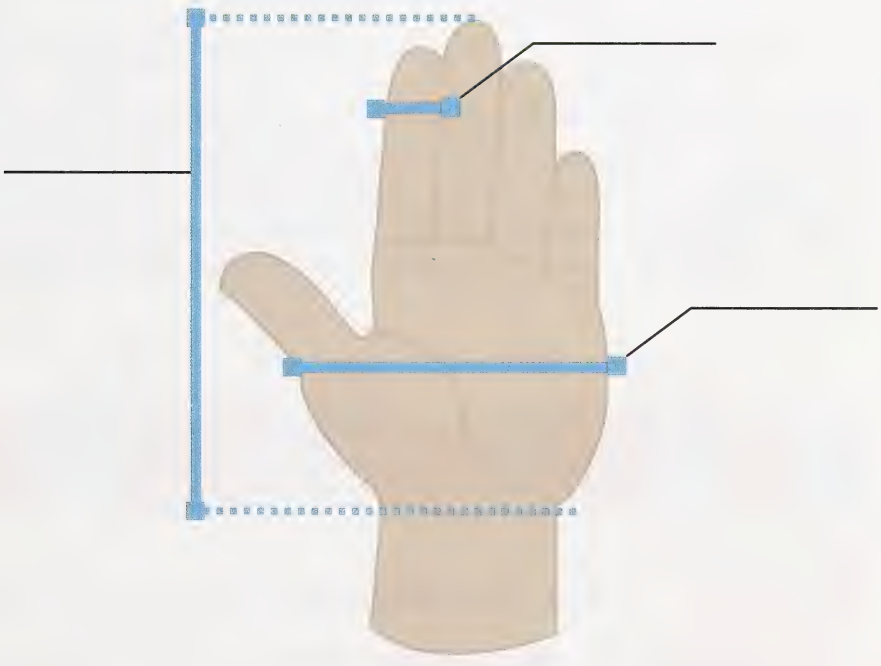
Exploration 2: Hand Measures

Materials: Unit 3, Lesson 2, Exploration 2 page from your Workbook, Centimetre grid paper, from the back of this Unit in your Workbook, Pencil, Paper

1. Place your hand with fingers together on a sheet of centimetre grid paper.
2. Trace your hand.
3. Measure the width of your hand as shown in the image.

4. Measure the length of your hand from the tip of your middle finger to the wrist.
5. Measure the width of your pointer finger.
6. Use your hand measures to estimate the measure of 5 objects in the room.

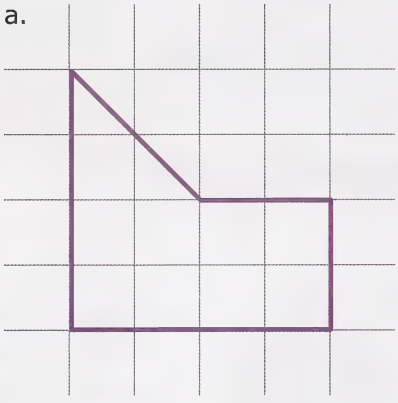
Label these parts on the image shown.



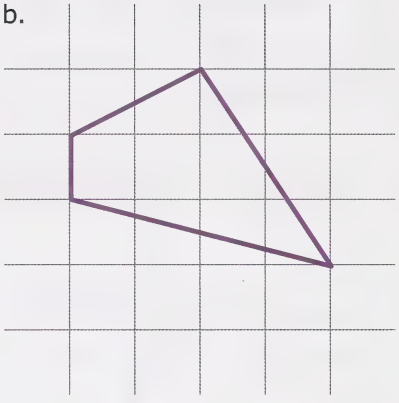
Now It's Your Turn

Estimate the area of the figures using centimetre grid paper.

a.



b.



Solutions

a. about 10 square centimetres

b. about 5 square centimetres

Reflection

Why would hand measures not always be useful?

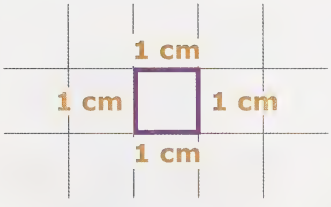
Let's Practice

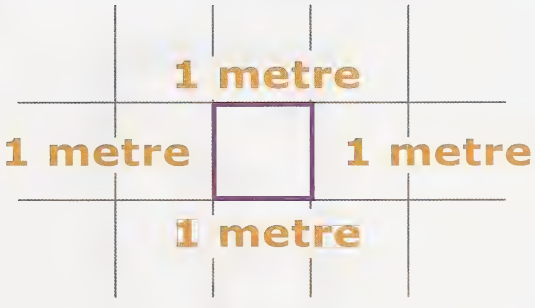
- Turn in your Workbook to Unit 3, Lesson 2 and complete 1 to 12.

Go online to complete the Concept Capsule about Estimating Area Using Concrete and Pictorial Representations (mm, cm, and m).

Best Measure

What if you don't have a ruler when you need to measure? You can use something that is almost a standard unit of measure, like your hand. Standard units are used most often and are agreed on in different locations. For area, the standard units are the centimetre square and the metre square.





You should remember that one metre is equal to 100 centimetres. This means a square metre is much larger than a square centimetre.

1 metre = 100 centimetres

The width of your finger is about one centimetre. You can use that estimated amount on your body to find things that measure about 1 centimetre square.

A shirt button is about 1 centimetre square.

The width of the doorway to your classroom or home is about one metre. You can stretch your arms out to compare your arm span to that measure.

Once you know how long a metre is on your body you can find objects that are about 1 metre square.

Can you think of other objects that are about 1 square metre?
1 square centimetre?

Example 3

Would you measure the object in square metres or square centimetres?

a. a window

It would be best to measure a window in square metres.
Most windows will be wider and higher than a metre, so it would be hard to use square centimetres.

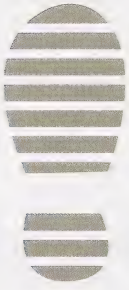
The answer is: square metres

b. a penny

A penny is over 1 cm wide and is much less than 1 metre. It is best to measure it in square centimetres.

The answer is: square centimetres

c. a shoe print



A shoe is shorter than a metre, so it is best to measure in square centimetres.

The answer is: square centimetres.

d. a kitchen floor

A kitchen floor is very large. It is best to measure floors in square metres.

The answer is: square metres

The following exploration will help you to understand how to estimate the area of large objects.

Exploration 3: Measuring Area

Materials: Unit 3, Lesson 1, Exploration 3 page from your Workbook, 5-Centimetre Square from the back of this Unit in your Workbook, Metre stick, Pencil, Scissors

Measure the following objects using a metre stick. Estimate the area.

1. A wall in your classroom or home
2. The space taken up on the floor by a sofa
3. A table top
4. The floor of your classroom or living room
5. Estimate the area of 4 other objects in square metres.

Cut out the 5-Centimetre Square from the back of this Unit in your Workbook. Measure the following objects using the square. The area of this square is 25 square centimetres. If it takes 2 of these to cover an object, the area is 50 square centimetres. Estimate the area.

6. The desktop
7. Your footprint
8. A picture frame

9. The cover of a book
10. Estimate the area of 4 other objects in square centimetres using your 5-centimetre square.
11. What is the best unit of measure for the desktop?
12. What is the best unit of measure for the floor of the living room?
13. Why did you choose the objects in number 5? Was it best to measure them with the square metre?
14. Why did you choose the objects in number 10? Was it best to measure them with the 5-centimetre square?
15. Reflect: What other size unit square could you use to measure objects in your environment? Why would it work best?

Let's Practice

- Turn in your Workbook to Unit 3, Lesson 2 and complete 13 to 21.

Lesson 3

Area of Rectangles

Interior Decorating

Alyssa's mom is designing a rug that is made up of 16 square metre rug tiles. She finds that she can make rugs of a few different sizes.

Although she tried to come up with other rectangles, she could not find any.

Reflection

What do you think? Are there any other rectangular rugs she can make with tiles that have an area of 16 square metres?

Objectives for this Lesson

In this lesson you will explore the following concepts:

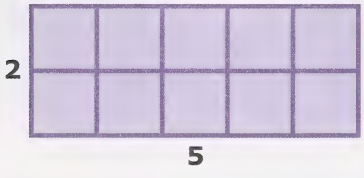
- Construct a rectangle for a given area
- Create more than one rectangle for the same given area

Constructing Rectangles

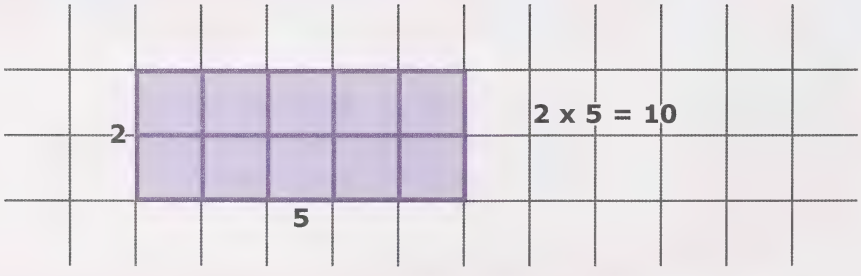
You should remember that rectangles have the following attributes:

- 4 sides
- opposite sides are congruent
- the corners are right angles

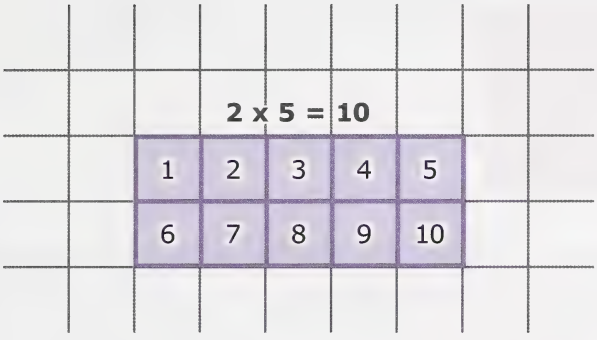
When you learned to multiply two numbers you used a model called an array:



This is very similar to an area model for a rectangle. All of the arrays were rectangles or squares. If the rectangular array for 2 x 5 = 10 was created on centimetre grid paper it would look like this:



Now count the square centimetres that create the rectangle to find the area:



The area is 10 square centimetres.

How does the area relate to the multiplication array? You should notice that they are the same. You can use this information to create rectangles for a given area. Just look for two numbers that multiply to equal that number.

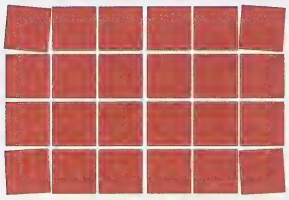
Let's explore! For these examples use your cut-out squares (from Lesson 2) or the grid paper from the back of this Unit in your Workbook.

Example 1

Create a rectangle that has an area of 24 square units.

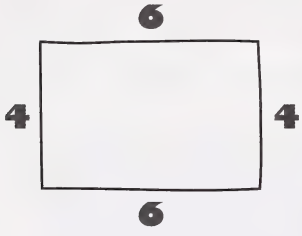
Use 24 of your cut-out squares. Arrange them until you get a rectangle.

Here is an arrangement you might have come up with:



The arrangement has 4 on one side and 6 on the other. Now draw your rectangle. Make sure to mark the sides.

The answer is:



There are other possibilities. This is how you come up with just one.

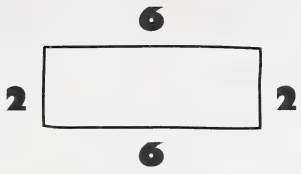
Example 2

Create a rectangle with an area of 12 square units.

Use your cut-out squares to create a model of a rectangle.

When you have one, draw it and label the sides.

One possible answer is:



How Many Rectangles?

Did you come up with a different answer for Example 1 or Example 2? That is because there can be more than one answer when creating a rectangle for a given area.

Reflection

Why is it possible that there can be more than one answer?

Let's Explore

Exploration 1: Multiple Rectangles

Materials: Unit 3, Lesson 3, Exploration 1 page from your Workbook, Cut-out Squares, Pencil

1. Gather 24 squares.
2. Make a rectangle with the squares. Record the side lengths.
3. Continue to make as many rectangles as you can for an area of 24 square units. Record the side lengths.
4. Gather 36 squares.
5. Make as many rectangles as you can for an area of 36 square units. Record the side lengths.
6. Gather 23 squares.
7. Make as many rectangles as you can for an area of 23 square units. Record the side lengths.
8. Make a rectangle using any number of squares.
9. What is the area of your rectangle? Record the area and side lengths.
10. Make as many rectangles as you can with this area. Record the side lengths.
11. Reflect: Why is there more than one rectangle for some and only one for others?

Keep out your cut-out squares to help you with the following example.

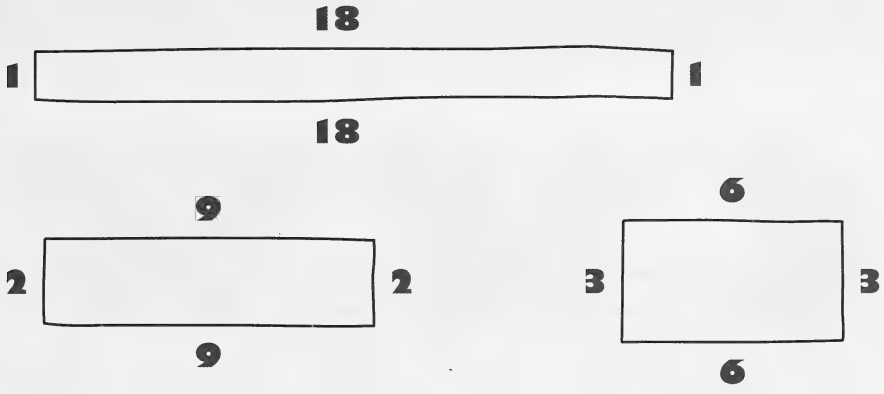
Example 3

Create as many rectangles as you can with an area of 18 square units.

Use your cut-out squares to help you as needed.

Draw rectangles and label their sides.

Here are all of the possible rectangles:



Example 4

How many rectangles are there with an area of 36 square units?

Begin with your cut-out squares. You should be able to make the rectangles listed in this table:

Side 1	Side 2	Area
1	36	36
2	18	36
3	12	36
4	9	36
6	6	36

That means that there are 6 different rectangles with an area of 36.

6 rectangles have an area of 36 square units.

- Turn in your Workbook to Unit 3, Lesson 3 and complete 1 to 15.

Go online to watch the Notepad Tutor: Construct Different Rectangles Given Either the Perimeter or Area.

Lesson 4

Symmetry

Mirror Image

Look at the butterfly. If the butterfly folded its wings together, the pattern on each side would overlap one another.

The exact shape and size of the left matches the exact shape and size of the right.

Reflection

Can you think of other examples in nature that have this property?

Objectives for this Lesson

In this lesson you will explore the following concepts:

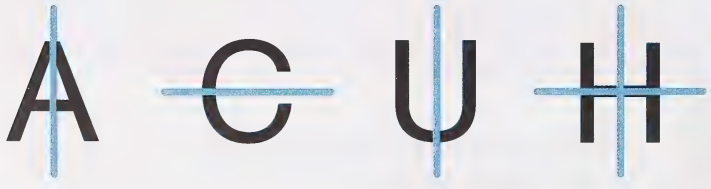
- Identify the characteristics of symmetrical shapes
- Sort shapes by characteristics of symmetry
- Complete the drawing of a shape given half the shape and its line of symmetry
- Use concrete materials to identify symmetrical shapes
- Provide examples of symmetrical shapes in the environment

Symmetrical Shapes

A **line of symmetry** is a line that can act as a "mirror" on a shape. In the letter M there is one line of symmetry. It is the line where you can fold the letter and the two sides will match.

Line of Symmetry **NOT a Line of Symmetry**

In the letters below, some have blue lines that are lines of symmetry.



The H has both a vertical and a horizontal line of symmetry.

Some of the letters have only **vertical** lines of symmetry. Some have **horizontal** lines of symmetry.

Exploration 1: Letters with Symmetry

Materials: Unit 3, Lesson 4, Exploration 1 page from your Workbook, Pencil, Paper

1. Fold a piece of paper in half. Write your name in all capital block letters across the fold of the paper.

DAKSHA

2. Look at the two halves of each letter. Are the two halves the same?
   - If a shape can be folded in half so that one half fits exactly on top of the other, then we say that the shape has line symmetry.
   - The fold is called a line of symmetry.
   - Letters that have this fold as a line of symmetry are said to have a horizontal line of symmetry

3. List all of the letters in your name that have a horizontal line of symmetry.

4. Look at the letters below.

   a b c d e f g h i j k l m n o p q r s t u v w x y z

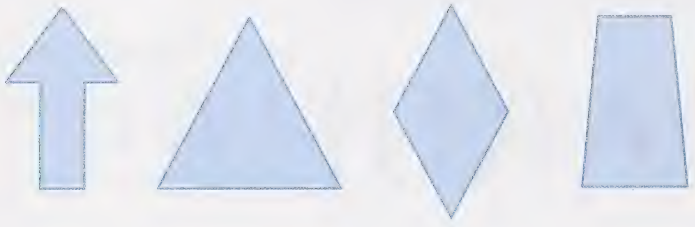
   A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

5. Do any have lines of symmetry? List them and draw the line of symmetry.

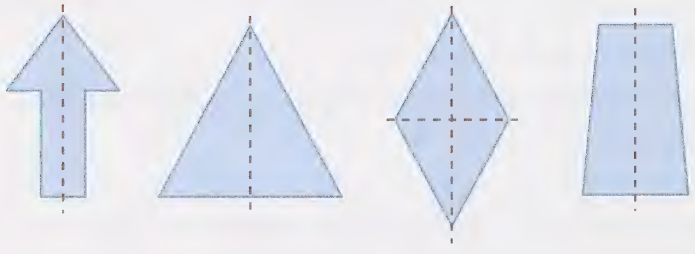
6. Do any letters have more than one line of symmetry? List them and draw all lines of symmetry.

Example 1

Draw all lines of symmetry on the given shapes. How many lines of symmetry are there for each shape?



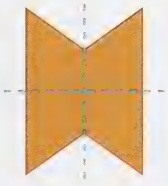
The dashed lines below are lines of symmetry.



Example 2

Draw all lines of symmetry. How many lines of symmetry are there?

Imagine drawing lines that you think will be symmetrical



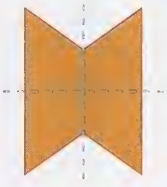
Imagine folding the object over the lines.

Ask yourself some questions. If you fold along the line, would you get the mirror image? Would the halves lie exactly on top of each other?

The blue dotted lines do not meet the criteria and are not lines of symmetry. The figure will not match if folded along these lines.

The blue dotted lines are the horizontal and vertical lines of symmetry.

Draw dotted lines to show lines of symmetry for only those that meet the criteria for being symmetrical.

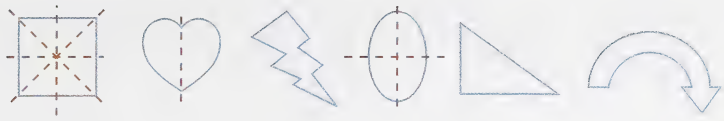


Example 3

Sort the 2 dimensional (2-D) shapes into a Carroll diagram.

	Curves	No Curves
Line of Symmetry		
No Line of Symmetry		

Draw the lines of symmetry on the figures, where possible.



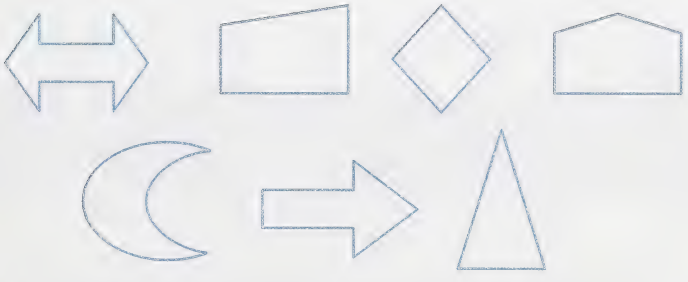
Sort shapes into the categories defined by the diagram:

	Curves	No Curves
Line of Symmetry		
No Line of Symmetry		

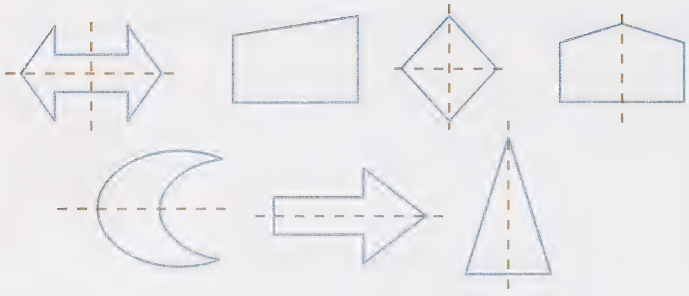
Example 4

Sort the shapes below in a Venn Diagram.

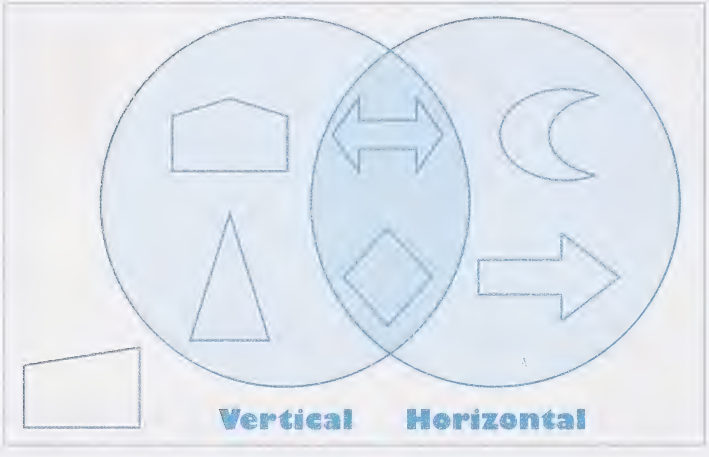
One circle represents shapes with a horizontal line of symmetry.
The other circle represents those with a vertical line of symmetry.



Draw lines of symmetry on the shapes, if possible.



Sort shapes according to the type of line symmetry.



- Turn in your Workbook to Unit 3, Lesson 4 and complete 1 to 5.

Use Symmetry to Draw a Figure

You only need two things to draw a figure with symmetry. You need the line of symmetry, and half of the image on one side of that line.

Example 5

Draw the other half of the figure. The line of symmetry is shown.

You may need to fold your paper and make a dot for each vertex.

Example 6

Tell if each figure has "none", "one", or "more than one" lines of symmetry.

a. 

b. 

c. 

d. 

Draw all lines of symmetry that are possible.

a. 

b. 

c. 

d. 

Give a category to each based on number of lines of symmetry.

a. more than one b. one c. none d. more than one

Shapes in the Environment

Symmetry is an important concept which is seen in lots of places in mathematics.

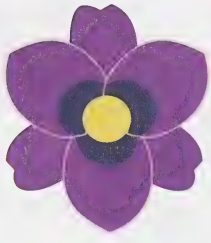
Think about your own body.

A vertical line divides your body symmetrically because you have an ear, eye, arm and leg on either side.

Reflection

Would a line across your waist be a line of symmetry?

Think about nature. There are many examples you could find that have one line of symmetry or more.



Think about symmetry at the beach. Some seashells are symmetrical.

Reflection

Look around. Do you see any objects with symmetry in your environment?

Example 7

Can you think of examples of symmetry inside the body?

Answers will vary for questions like this. Here are some body parts that have symmetry:

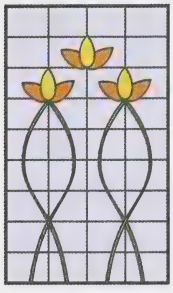
the kidneys, the brain, the skull...

Example 8

Which of these has symmetry?

They each have a line of symmetry.

Stained glass windows often have lines of symmetry.



Exploration 2: Design a Stained Glass Window

Materials: Unit 3, Lesson 4, Exploration 2 page from your Workbook, Paper, Pencil, Coloured pencils

Optional materials: construction paper, tissue paper

Try making your own stained glass window pattern. Use shapes from this lesson to help you. Show how your window pattern uses symmetry.

Let's Practice

- Turn in your Workbook to Unit 3, Lesson 4 and complete 6 to 15.

Go online to complete the Concept Capsule about Naming Transformations.

Lesson 5

Time

Lift Off

When the space shuttle is going to lift-off, there is a countdown. The countdown is displayed in military time, beginning three days before the exact time of lift-off. When the countdown clock reads:

03:12:14

...there are 3 hours, 12 minutes and 14 seconds left until lift-off.

Reflection

What is another situation in which countdowns are used?

Objectives for this Lesson

In this lesson you will explore the following concepts:

- State the number of hours in a day
- Explain the meaning of AM and PM
- Express the time in written form and numerically
- Describe time as "minutes to" or "minutes after"
- Write and identify dates in different formats
- Identify dates on a calendar
- Read and record time using digital and analog clocks
- Read and record calendar dates in a variety of formats

What is Noon and Midnight?

Every day has 24 hours. There are two parts to the 24-hour day. In the 1600s it became normal to use the Latin phrases **ante meridian** and **post meridian** to describe the two parts of the day.

The first part of the day begins after midnight. The initials AM stand for ante meridian or before midday. The entire 12 hours that begin after midnight should be described with AM.

> The baby woke everyone up at 3:05 AM.
> It was 5:00 AM when Alyssa's alarm went off.
> The lunch bell rang at 11:25 AM.

The initials PM stand for post meridian or after midday. PM starts immediately after noon. The entire 12 hours that begin at noon and go to midnight are described with PM.

Zach got out of school at 2:35 PM.
Lian was ready at 4:30 PM to go home from swimming practice.
Dinner was served at 6:30 PM.

You should be able to tell what time of day it is using AM and PM.

Midnight and noon do not have an AM or PM due to the definitions. Some people will mark midnight as 12:00 AM and noon as 12:00 PM anyway, to tell the two apart.

Example 1

It is 10:00 PM and you are coming home from a play. Will your parents need to turn on their headlights to drive?

Yes. 10:00 PM is in the evening and it will be dark. 10:00 AM is morning when it would be daylight.

Example 2

It is 8:00 and school is about to begin. Is it AM or PM?

It is AM. School begins in the morning.

Hours in a Day

On an **analog clock** or **face clock** you will usually see the numbers 1 through 12. Sometimes the face of the clock will only have marks for these numbers.

There are two hands on the clock. The shortest hand is the hour hand and the longest is the minute hand. The hands move in this direction:

The hour hand will go around the clock twice each day. That makes 24 hours in a day.

How many hours are in a day?	24 hours
How many minutes are in an hour?	60 minutes

What Time is It?

There are 12 hours, and 60 minutes shown on a face of a clock. The hours are simply read by looking at where the short hand falls. If it is between the 1 and the 2 then the hours will be 1.

If the short hand is between the 10 and 11, as in this picture, then the hours will be 10.

Cameron watches the clock closely for an hour. He observes that:

- The short hand travels from the 9 to the 10.
- The minute hand goes around the clock face one time.

The short hand marks hours. It will take one hour to get from one number to the next. It will take 12 hours to travel all the way around the clock.

The minute hand will go from one number to the next in 5 minutes. It will go all the way around the clock in one hour. All of the numbers on the clock face represent another 5 minutes. Each small mark between two numbers on the clock face represents one minute.

The blue numbers on the outside of the clock face represent the number of minutes passed since the start of an hour.

The time on this clock is 5:55.
The short hand is almost to the 6 and the long hand is on the 11. You start at the 12 and count by 5s until you get to the minute hand.

Here are some clocks with their time beneath:

3:10

9:58

2:32

Expressing Time in Words

When you express the time in words you would describe the number of minutes past the hour or after the hour if the minute hand is in this area:

If the minutes are 31 to 59 minutes as shown here, you would describe the number of minutes to the hour.

If the minute hand is on the 6 meaning 30 minutes have passed since the hour, you can say: 30 minutes past the hour or 30 minutes to the hour.

3:10

Ten Minutes Past 3 o'clock

9:58

Two Minutes To 10 o'clock

2:32

Twenty-Eight Minutes To 3 o'clock

Example 3

What time is displayed on the clock? Describe the time in words and write numeric time.

1. Read the hour hand first. Locate the number that the short hand is on or after.

   The short hand is on the 4.

2. Read the minute hand. Count by fives from the 12 to the number on the clock where the long hand is located.

   The long hand is on the 1.
   The long hand represents 5 minutes.

3. You would "say" the time is:

   five minutes after 4 o'clock

4. In numeric form the time is 4:05.

Reflection

Can you tell if it is AM or PM? Why or why not?

Example 4

What time is displayed on the clock?
Express in words and numbers.

1. Read the hour hand first. Locate the number that the short hand is on or past.

   In this case, the short hand is almost to the seven. The hour is six.

2. Read the minute hand. Count by fives from the 12 to the number before the long hand. Then add one for each small mark. In this case, from the 12 to the 9 is 45 minutes. Add 3 for the marks after the 9.

   The minutes are 45 + 3 = 48 minutes.

3. Notice on the clock that there are 12 minute spaces between the long hand and the 12.

   You would say: twelve minutes to 7 o'clock.

4. In numeric form the time is: 6:48

Exploration 1: Make Your Own Clock

Materials: Unit 3, Lesson 5, Exploration 1 page from your Workbook, Clock Pattern from the back of this Unit in your Workbook, Brad, Hole punch, Pencil

To make the clock:

1. Cut out the clock pattern found at the end of this Unit in your Workbook.
2. Cut out the minute and hour hand patterns.
3. Put the hour hand on top of the minute hand so they line up at the flat end.
4. Punch a hole in the hands.

5. Put the brad through the holes and poke it through the dot in the middle of the clock pattern.

6. Attach the brad loosely on the back. The hands should be able to move freely.

Make these times with your clock:

7. 9:15 8. 10:45 9. 2:05 10. 12:30

11. twenty to seven o'clock 12. twelve after eight o'clock

13. Make three times of your own on your clock. Write the times in numeric and word form.

Reading a Digital Clock

On a digital clock you can tell if it is AM or PM. It will have the time displayed and AM or PM will show on the front of the clock.

The following digital clock shows seven o'clock AM.

Example 5

What time is it?

You would say: fifteen minutes past 8 o'clock PM

You would write: 8:15 PM

Go online to complete the Concept Capsule about Telling Time.

- Turn in your Workbook to Unit 3, Lesson 5 and complete 1 to 14.

What Day Is It?

Our calendar year is divided into 12 months. There are 52 weeks in a year. Each week has 7 days in it.

Have you ever heard the **rhyme** below?

Thirty days hath September, April, June, and November.
All the rest have thirty-one,
except for February alone, and it has twenty-eight days' time,
but in leap years, February has twenty-nine.

Month	Number of Days
January	31
February	28 (29 on leap years, like 2008)
March	31
April	30
May	31
June	30
July	31
August	31
September	30
October	31
November	30
December	31

Look at the calendar template below. If the first day of September begins on a Tuesday, then the calendar would look like the one below.

SEPTEMBER 2008

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

Writing Dates

Dates can be written in different formats. Look at the formats below. The ys represent each digit of the year. The ms stand for digits of the month and the ds represent the digits of the day.

yyyy/mm/dd **dd/mm/yyyy** **dd/mm/yy** **March 21, 2006**

The days and the years are already numbers. You may be wondering how the months become digits. There are 12 months in the year. Each month is given a number based on when it falls from January to December.

Month Number	Month
1	January
2	February
3	March
4	April
5	May
6	June
7	July
8	August
9	September
10	October
11	November
12	December

Example 6

Write June 15, 1995 in the three other formats.

1. Locate the year. It is 1995.
2. Locate the month: June. It is the sixth month of the year.
3. The day is the 15th of the month.
4. Replace the year, month and day into the different formats.

yyyy/mm/dd	dd/mm/yyyy	dd/mm/yy
1995/06/15	15/06/1995	15/06/95

Example 7

Name the date circled on the calendar.

MARCH 2008

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

1. Find the month labelled on the calendar.
   March — This is the 3rd month.
2. Find the year labelled on the calendar.
   2008 — For yy you would write 08 or the last two digits of the year.

3. Find the day that is circled on the calendar.

(27)

The date is: March 27, 2008
The date can also be written:
yyyy/mm/dd 2008/03/27
mm/dd/yyyy 03/27/2008
dd/mm/yy 27/03/08

Now It's Your Turn

Name the dates that are circled on the calendars and write them in 3 different formats.

April 2005

S	M	T	W	T	F	S
					1	2
3	(4)	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

JANUARY 2006

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	(30)	31				

DECEMBER 2008

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	(25)	26	27
28	29	30	31			

a. _____ b. _____ c. _____

Solutions

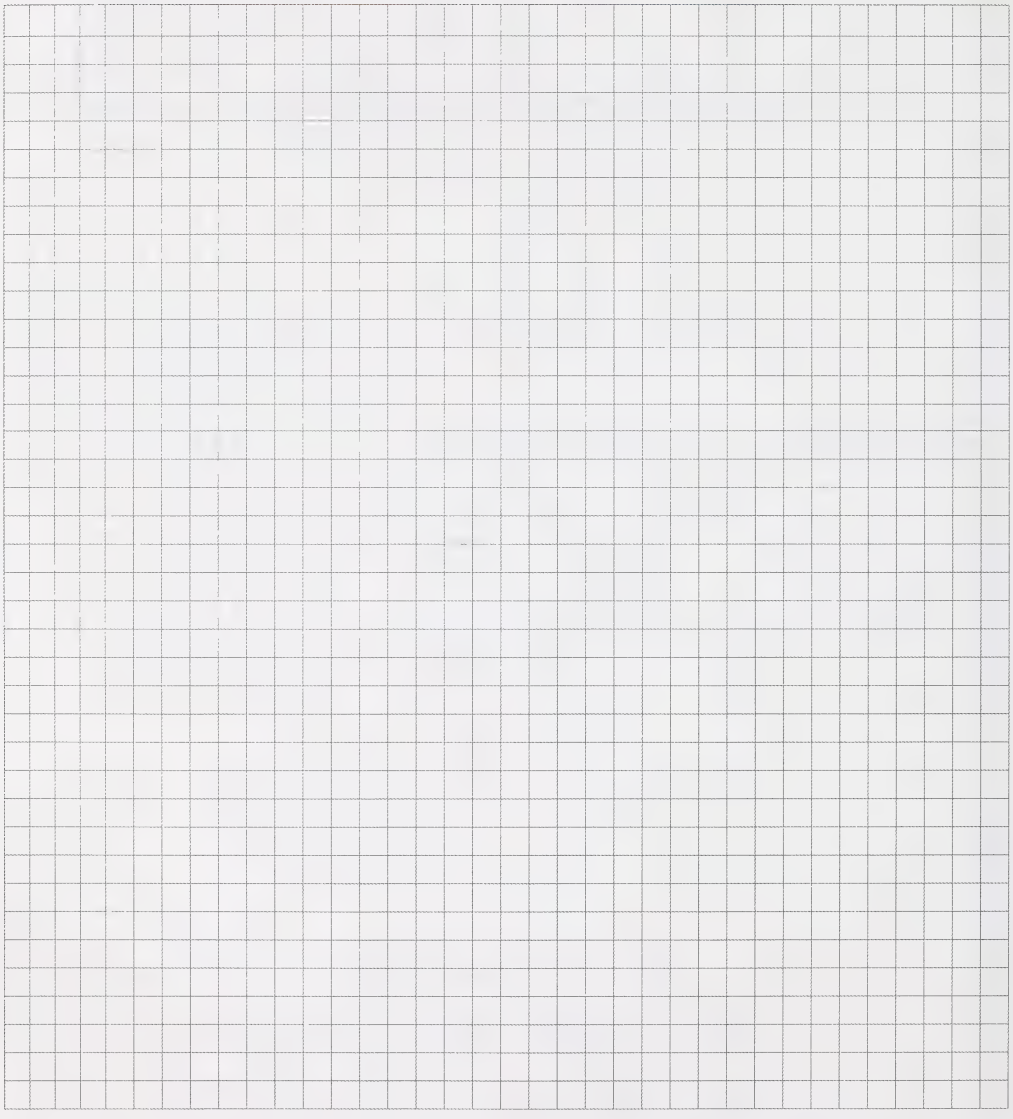
a. 04/04/05, 04/04/2005, 2005/04/04, April 4, 2005

b. 01/30/06, 30/01/2006, 2006/01/30, January 30, 2006

c. 12/25/08, 25/12/2008, 2008/12/25, December 25, 2008

Let's Practice

- Turn in your Workbook to Unit 3, Lesson 5 and complete 15 to 24.



Lesson 6

Identifying Prisms

Dice Games

Daksha and his brother and sister are playing a dice game. When a die is rolled, one number is displayed on the top.

When you roll the dice they will only land with a flat surface down. They will not land on a corner or an edge.

The shape of a die has a name.

Reflection

What is the name for the shape of a die? Can you think of the names for the parts of this figure?

Objectives for this Lesson

In this lesson you will explore the following concepts:

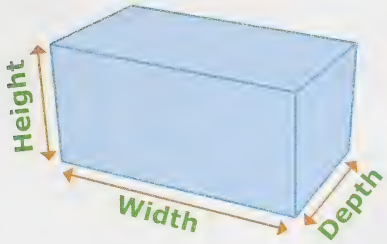
- Identify and name parts of rectangular prisms
- Identify and name parts of triangular prisms
- Sort prisms by their attributes
- Identify prisms in the environment

Prisms

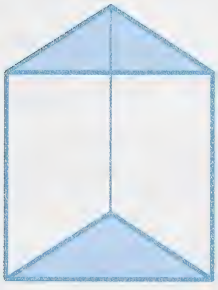
A figure is called three-dimensional or 3-D when it has the three dimensions. The dimensions of a 3-D image are height, width and depth.

A **rectangular prism** and a triangular prism are just two examples of 3-D figures.

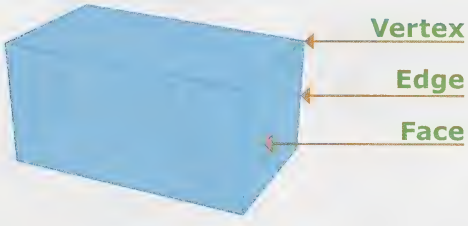
A rectangular prism has bases that are rectangles.



A **triangular prism** has bases that are triangles.



Parts of a Prism



All prisms have four parts:

- edge
- vertex
- face
- base

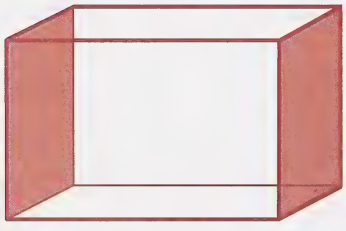
The **edge** of a prism is a line segment where two sides come together.

A **vertex** is a point where the edges meet. You may have called it the corner.

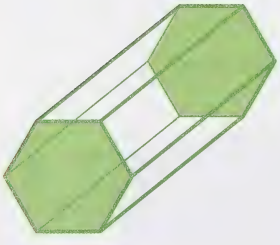
The flat side is called a **face**. The faces are always rectangles on a prism.

In every prism there are at least two faces that are congruent and parallel. These may be the shape of a rectangle or any other shape. Each of these is called a **base**.

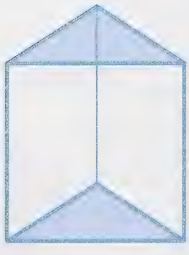
Can you tell that the shaded parts of these prisms are the bases?



Rectangular Prism



Hexagonal Prism

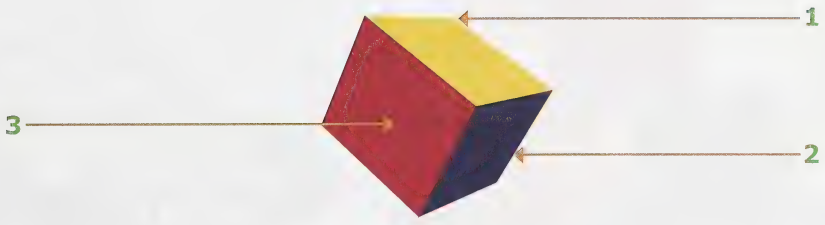


Triangular Prism

Each prism is named for the shape of its base. The bases are congruent. Prisms often "sit" on their base, but not always. In this picture the triangular prism is the only one sitting on its base. In the square prism the squares are the base because there are only two faces with that shape. Those two bases are parallel and congruent.

Example 1

Label the parts of the rectangular prism.



1. Vertex
2. Edge
3. Face

Rectangular Prisms

Rectangular Prisms are everywhere. They may hold your cereal. A rectangular prism might contain a wealth of knowledge. You may even be comfortable at night because of a rectangular prism.

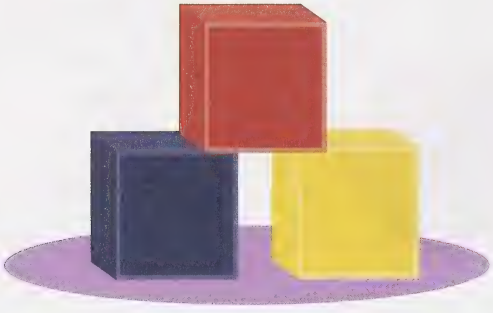
box

book

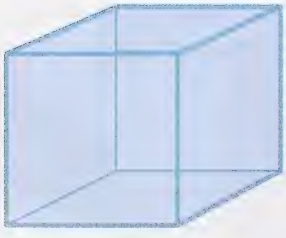
bed

You probably played with blocks when you were younger. You probably never imagined that you were studying math! You are already familiar

with a cube from one of those blocks or from rolling dice to play a game. There is more to learn about a cube.



A cube is a special rectangular prism because all of its faces are congruent squares.



Cube

Rectangular Prism

Let's Explore

Exploration 1: Cereal Box Prism

Materials: Unit 3, Lesson 6, Exploration 1 page from your Workbook, A cereal box

Do the following:

1. Take your cereal box and sit it on the table in front of you the way it would sit on the grocery store shelf.

You are looking at a rectangular prism.

2. Put your hand on the "top" of the box.

If you decide this is a base of the rectangular prism then where is the other base?

It is on the "bottom" or the side that is on the table.

3. Put your hand on one "side" of the box and put the other on the opposite side.

You now have your hands on two bases of the box.

4. Put your hand on the front of the box and the other hand on the back.

You could also call these two sides the bases of the box.

All of the sides of the box you have just touched or identified can be called faces. There are SIX faces on a rectangular prism. Two of these faces can be called the bases. It doesn't matter which two you choose to be the bases as long as you pick two that are parallel and congruent.

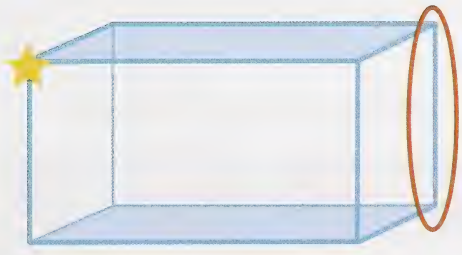
Example 2

Complete the following statements:

A. The _____ of the rectangular prism are shaded.

B. The circled figure is called a(n) _____.

C. The star is on a _____ of the prism.



A. The bases of the rectangular prism are shaded.

B. The circled figure is called a(n) edge.

C. The star is on a vertex of the prism.

Let's explore! Here is an exploration to help you learn the parts of a rectangular prism. Don't eat the materials until you are finished answering the questions!

Exploration 2: Toothpick Rectangular Prism

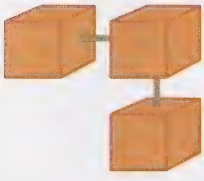
Materials: Unit 3, Lesson 6, Exploration 2 page from your Workbook, Cheese cubes, Toothpicks, Pencil

Procedures:

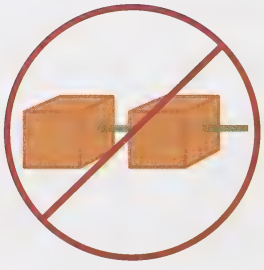
1. Create a rectangular prism using the provided materials.

   You will use the cheese cubes as connectors for the toothpicks. When you connect the pieces you want to follow the example below.

Connect them like this:



NOT like this:



2. Place your constructed rectangular prism on the blue mat. Look at your neighbour's prism. Does it look like yours? Should it? Explain.

3. Describe the faces of the rectangular prism.

4. Record the number of vertices, edges and faces in the table.

Example 3

Name three objects that are in the shape of a rectangular prism.

Sample answers are:

A television, a laptop computer, a DVD case

Reflection

Are there any rectangular prisms in your classroom or home?

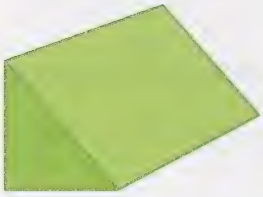
Let's Practice

Go online to complete the Concept Capsule about Identifying Parts of Prisms.

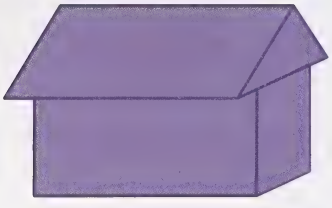
- Turn in your Workbook to Unit 3, Lesson 6 and complete 1 to 6.

Triangular Prisms

Triangular prisms are not as common or may not be as easy to recognize as rectangular prisms.



A house is sometimes made from a rectangular prism and a triangular prism.



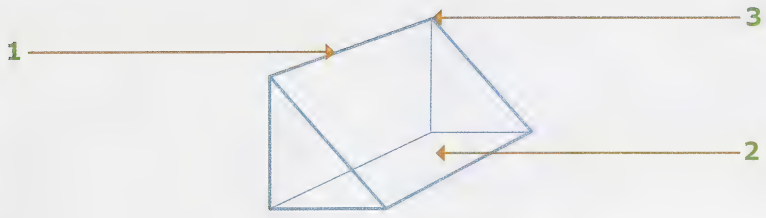
The roof is a triangular prism. The bottom of the house is a rectangular prism.

Triangular prisms are made up of 2 triangles which are the bases. The three faces are all rectangles.

Have you ever thought about the shape of chocolate bars? Almost all chocolate bars are shaped like a rectangular prism, but there is one that is in the shape of a triangular prism. It might not be as common as other chocolate bars, but it is fine chocolate!

Example 4

Label the parts of a triangular prism.



1. Edge
2. Face
3. Vertex

Let's Explore! You are going to wish you had not eaten all those cheese cubes! This time, try making a triangular prism and compare the results of this exploration with the first one.

Exploration 3: Creating a Triangular Prism

Materials: Unit 3, Lesson 6, Exploration 3 page from your Workbook, Cheese cubes, Toothpicks, Pencil

1. Create a triangular prism using the provided materials. Use the same method of connecting the cheese cubes and toothpicks that you used in Exploration 2.

2. Place your constructed triangular prism on the blue mat. Next, look at your neighbour's prism. Does it look like yours? Should it? Explain.

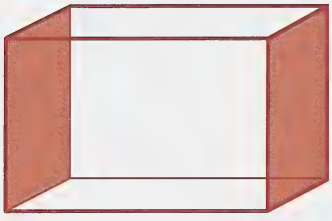
3. What part of a prism do the toothpicks represent?
4. What part of a prism do the cheese cubes represent?
5. What represents the faces of the triangular prism?
6. Complete the table with this information.

Putting it all Together

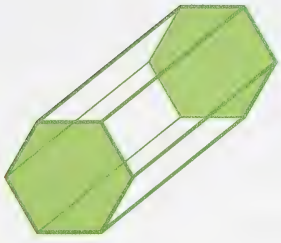
7. Complete the table that compares rectangular prisms and triangular prisms.
8. How are rectangular and triangular prisms alike?
9. How are rectangular and triangular prisms different?
10. Can you always stack rectangular prisms? How about triangular prisms?
11. If you created a new brand of cereal, what shape would you make the cereal box?
12. Explain why you use the two terms, face and base.

Sorting Prisms

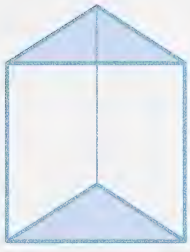
The shape of the base is how you know what to call the prism. If the base is shaped like a rectangle, it is a rectangular prism. All prisms have rectangular faces, so be careful.



Rectangular prism



Hexagonal Prism

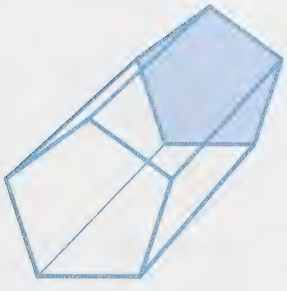


Triangular Prism

The easiest way to name prisms is to first identify the shape of each face. The two faces that are congruent and parallel to each other are the bases. The shape of the base gives the name of the prism. For example, if the base of a prism is a triangle, then the figure is a triangular prism.

Example 5

Name the prism.



What is the shape of the bases? A five sided polygon is a **pentagon**.

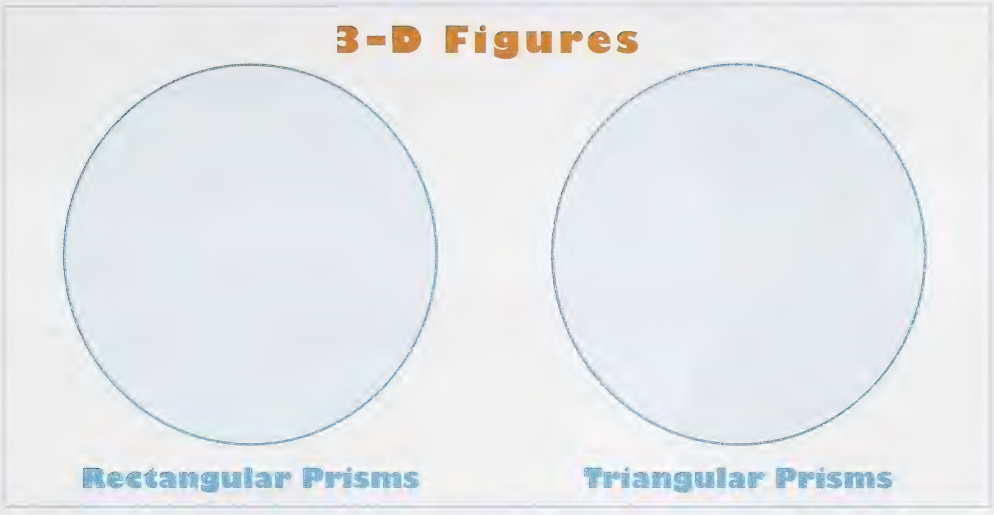
The prism is a pentagonal prism.

Here are the names of the prisms with different base shapes you should be familiar with:

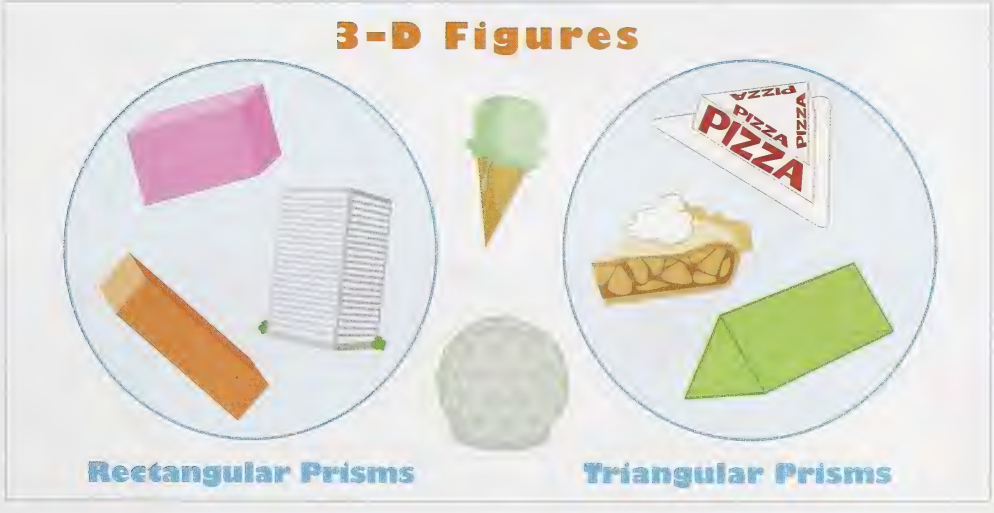
Shape of Base	Number of Edges on the Base	Prism Name
Triangle	3	Triangular Prism
Rectangle	4	Rectangular Prism
Pentagon	5	Pentagonal Prism
Hexagon	6	Hexagonal Prism

Example 6

Use the Venn Diagram to sort the following 3-D Figures.



The answer is:



Reflection

What are some objects that are made up of more than one prism?

Let's Practice

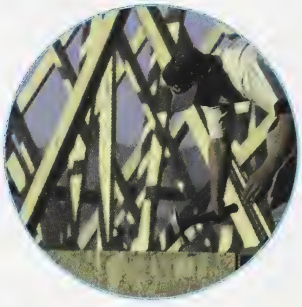
- Turn in your Workbook to Unit 3, Lesson 6 and complete 7 to 20.

Math 4 Unit 3

Lesson 7

Constructing Prisms

Home Construction



Alyssa's Uncle Jake builds homes for a living. He has to use many shapes to build the homes. Some of the homes he builds are a combination of rectangular prisms and triangular prisms.

When he builds the house, he cannot just pick up a whole triangular prism and put it on as the roof. His team must create the faces and the bases one at a time.

Reflection

What is the shape of each of these parts?

Objectives for this Lesson

In this lesson you will explore the following concepts:

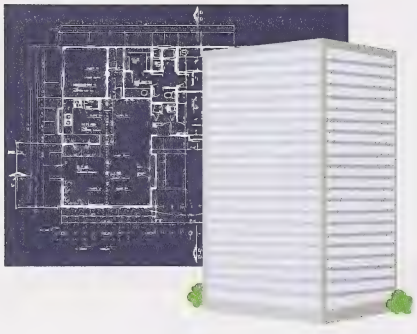
- Construct and describe models of rectangular and triangular prisms
- Construct rectangular prisms from their nets
- Construct triangular prisms from their nets

Prism Construction

Have you ever constructed a building with blocks? To construct means to make or form by combining or arranging parts.

What do you need before you can make a cake? A recipe of course!

What do you need before you can build a house or a high-rise condo? A blueprint!



There are six faces on a rectangular prism. They are all rectangles.

There are five faces on a triangular prism. The shapes of the faces are:

Example 1

Which of the following cannot be the face of a rectangular prism?

a.  b.  c.  d. 

a, b, and c can all be faces of a rectangular prism. D is the answer.

Reflection

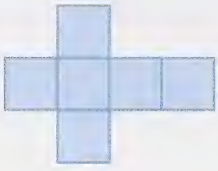
What are the shapes of the faces of a triangular prism?

Nets of Prisms

To make a prism you can use a net. A net is a flat figure that can be cut out and folded into a 3-D figure.

Cube

Net of the Cube



Let's explore! Do the following exploration to help you visualize how to put together a rectangular prism.

Exploration 1: Cereal Box Net

Materials: Unit 3, Lesson 7, Exploration 1 page from your Workbook, Empty cereal box, Scissors or a craft knife, Pencil, Glue or tape

Procedures:

1. Glue or tape the top back together so that it is closed.

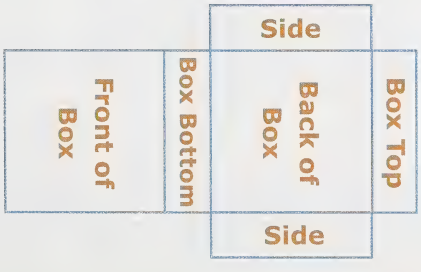
Get the help of an adult for the following:

2. Cut the two short EDGES and one long EDGE of the top.

3. Now the box top should still be connected at the back of the box.
4. Cut down the two front edges of the box.

5. Now the front of the box is no longer attached to the side.
6. Cut along the edges that connect the sides of the box to the bottom of the box.

7. Now you should have a flat shape that looks like this:



This is called a net of the box. This is one way all the faces can be connected and fold up to form a box. Are there other nets of the box that you can make?

8. Cut along all edges that are still connecting two faces of the box. Now you will have six rectangles or faces.

9. Use the cut out faces and see how many nets you can make that would fold up to make a box. You may want to use tape to keep the pieces together to test them.

10. Sketch a picture of each net.

Just as there are many ways to build a house or make a cake there can be more than one way to build a prism.

Exploration 2: Nets of a Cube

Materials: Unit 3, Lesson 7, Exploration 2 page from your Workbook, Grid paper from the back of this Unit in your Workbook, Scissors, Tape, Pencil

1. Cut out each net provided.

2. Test these nets by seeing if they will fold into a cube.

   Hint: There are less than 15 that form a cube.

3. Use the grid paper to shade in the squares to model each net.

4. Reflect: Why are some nets the same even when they look different on the grid paper?

Is This a Net?

From Exploration 2, you should have learned about the relationship between the number of faces and the ability to form a cube. Although a cube has six squares as faces, you cannot create a cube with just any arrangement of those faces.

Example 2

Are the following nets of a cube? Why or why not?

a. 

b. 

a. This is not a net because the top two squares will collide when folded.

b. This one will not work because it only has five squares and a cube has six faces.

Let's Explore

Exploration 3: Constructing a Triangular Prism

Materials: Unit 3, Lesson 7, Exploration 3 page from your Workbook, Card stock or cardboard, Scissors, Pencil, Glue or tape

1. Cut out the triangular prism pattern.
2. Glue the pattern on top of your card stock.
3. Cut out the pattern along the bold black lines.
4. Fold along the dotted lines.
5. Fold the flaps in toward the middle of the prism.
6. Tape the edges of the prism together to create the prism.
7. Draw another pattern that would make a triangular prism.
8. Reflect: What would happen to the nets of a triangular prism if the triangle side lengths are changed?

Let's Practice

Go online to watch the Notepad Tutor about Constructing Prisms.

- Turn in your Workbook to Unit 3, Lesson 7 and complete 1 to 12.

Math 4 Unit 4

Lesson 1

Understanding Graphs

Bar Graphs and Pictographs

You will encounter bar graphs and pictographs in the real world.

These graphs help you to summarize data quickly. You can find the answers to questions about data faster with graphs.

Reflection

What types of data would you graph?

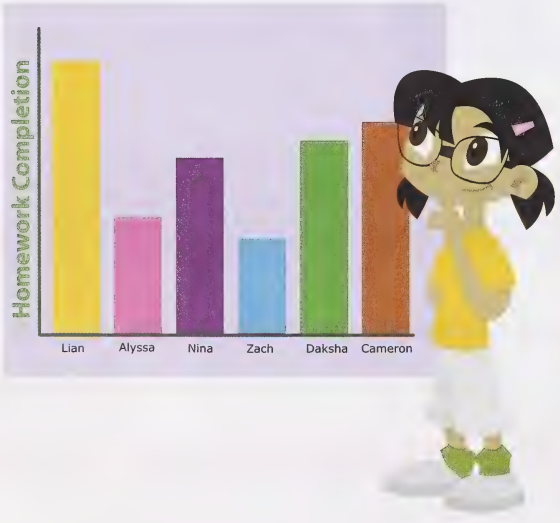
Objectives for this Lesson

In this lesson you will explore the following concepts:

- Interpreting graphs
- Comparing types of graphs and explaining why the chosen graph was used
- Comparing graphs in which the same data has been displayed using various groupings of data
- Determining the best method of grouping data for constructing graphs
- Finding examples of graphs in print and electronic media, such as newspapers, magazines and the Internet

Using Graphs

You can answer questions faster when you have organized data. Graphs display data, and make the data more meaningful. Have you ever heard, "a picture is worth a thousand words"? A graph is like a picture of numbers. The graph can give meaning to the numbers.



Let's Explore

Exploration 1: Interpreting Data

Materials: Unit 4, Lesson 1, Exploration 1 page from your Workbook, Pencil

20 boys and girls went on a Scout Camping trip. After the trip they completed a survey.

Here are two of the survey questions:

What is your favourite thing about camping?

a. roasting marshmallows

b. campfire time

c. outdoor activities

d. enjoying scenery

What is your favourite merit badge class?

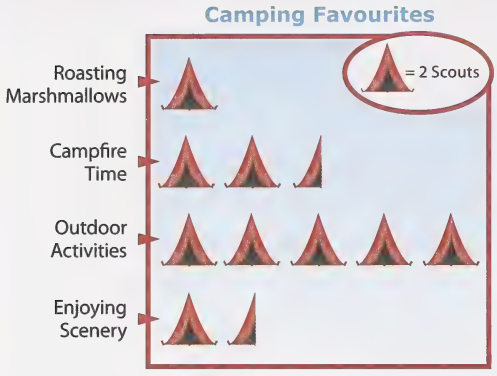
a. archery

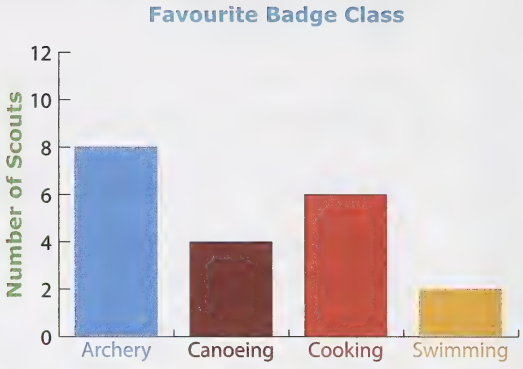
b. canoeing

c. cooking

d. swimming

Here are the results:





You may notice that the tents equal more than one scout's vote in the first graph. The **scale** for the second graph is also different than normal. Instead of marking all numbers it is counting by 2s.

Use the graphs to answer the following:

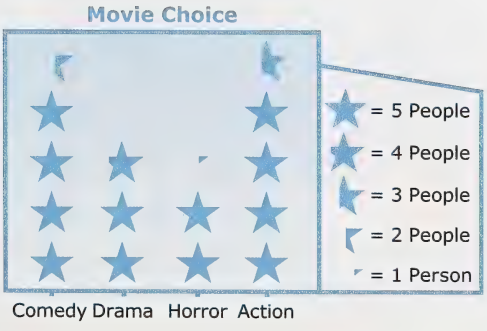
1. How many scouts chose roasting marshmallows for their favourite thing about camping?
2. How many scouts chose enjoying the scenery for their favourite thing about camping?
3. How many scouts chose canoeing as their favourite merit badge class?
4. How many scouts chose cooking as their favourite merit badge class?
5. The number of scouts who chose cooking as their favourite merit badge class is the same as what two classes combined?
6. What was the most popular merit badge class?

7. What was the most popular thing about camping?
8. How many more scouts liked cooking than swimming?
9. How many less scouts liked campfire time than outdoor activities?
10. How many scouts liked canoeing or swimming?
11. Write your own question about the Camping Favourites graph and answer it.
12. Write your own question about the Favourite Badge Class graph and answer it.
13. Reflect: Why do you think the creator of the graph made the tent equal to 2 scouts on the Camping Favourites graph?
14. Reflect: Why do you think the creator of the graphs made the scale counting by twos on the Favourite Badge Class graph?

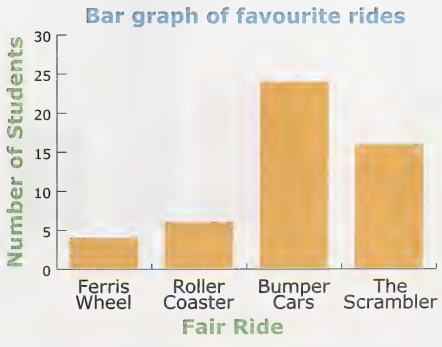
Types of Graphs

Here are the two types of graphs you interpreted in Exploration 1:

Pictograph



Bar Graph

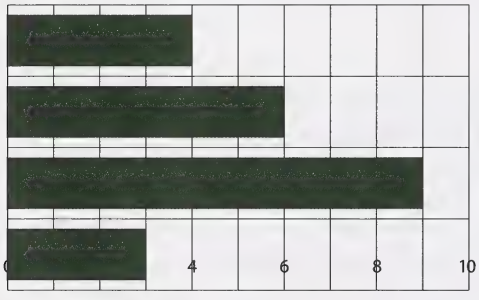


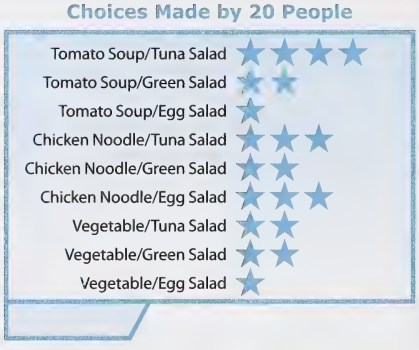
A **pictograph** displays data with picture symbols. If the symbol represents more than one in number then it has a **legend**. In the pictograph titled "Movie Choice" the scale is "one star equals 5 people". The star can be displayed in pieces for smaller numbers.

A **bar graph** displays data with bars that represent numbers. The numbers are shown by the length or height of the bar. The scale lets you figure out what the number means.

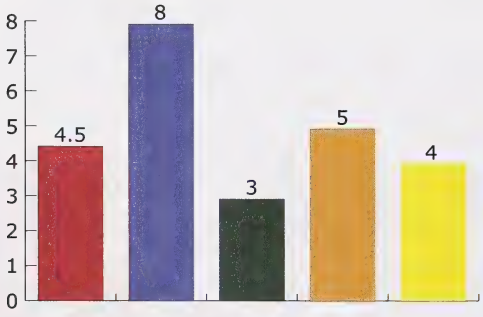
Both of these graphs can be created **horizontal** or **vertical**.

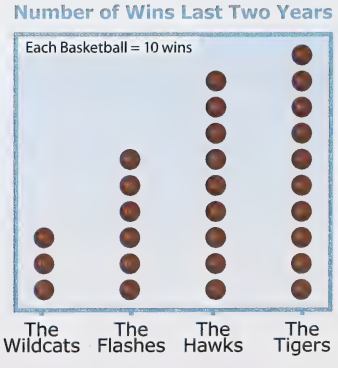
Horizontal means that the bars or the pictures go from left to right across the page:





Vertical means that the bars or pictures go up and down the page:



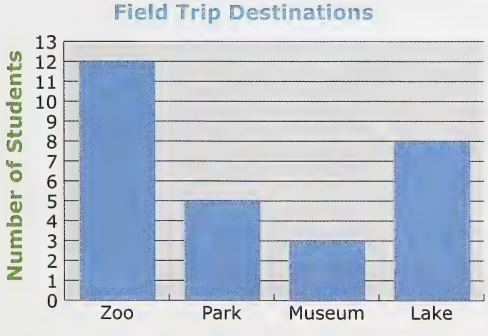


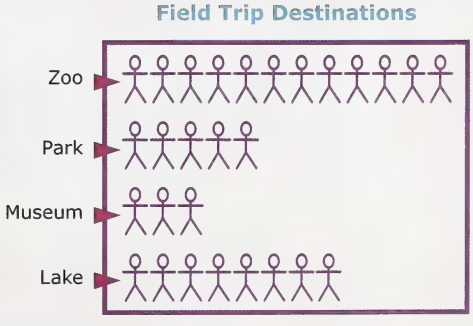
Reflection

Can you use a bar graph or pictograph to portray the same set of data?

Look at the graphs of the information in this table:

Field Trip Survey Results	
Zoo	12
Park	5
Museum	3
Lake	8

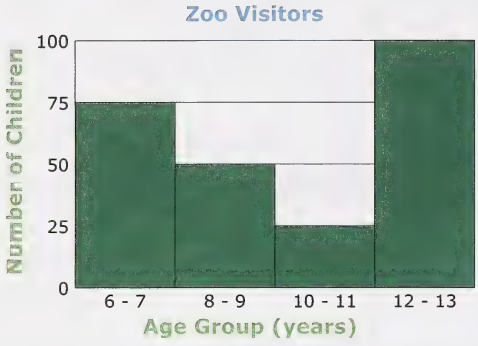




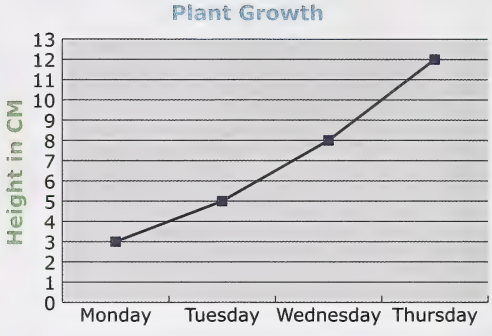
You can use either type of graph for the same information.

Other types of graphs are:

Histogram



Line Graph



Histograms are used when there is an interval for data to fall within. The columns of a histogram are called **bins**. Bins represent an **interval** for the data. The interval is a range of the thing you are measuring.

Line graphs are used when you want to compare data over time. This allows you to compare values from one to the next.

So how do you know when to use which type of graph? Here is a summary to help you.

Graph	Use this graph when...
Bar Graphs	data can be counted and placed in categories you want to compare.
Pictographs	data are multiples of each other.
Line Graphs	you want to show change over time.
Histogram	you want to show how often data happens during an interval.

Don't confuse histograms with bar graphs. In a bar graph the bars represent categories. In a histogram the bins represent how often a certain interval or range of something occurs.

Reflection

Which type of graph is easier to create? Which type of graph is easier to read? When would you use a pictograph instead of a bar graph?

Example 1

What type of graph would you use for the following data?

A.

Time	Number of Students
10 - 15 sec	3
15 - 20 sec	5
20 - 25 sec	8
25 - 30 sec	2

The numbers of students are lined up with time intervals. The best graph to use for this data is a histogram.

B.

Colour	Number of Candies
Red	8
Blue	2
Brown	14
Green	5

The colours are categories for the number of candies. This could be a pictograph or a bar graph.

C.

Month	Balance in Dollars
January	120
February	180
March	185
April	210

The balance in dollars data is shown over time. The best graph for showing this growth in the balance over time is a line graph.

D.

Article of Clothing	Number
Shirt	12
Shoes	2
Pants	8
Skirts	4

Each number representing the articles of clothing can be divided by 2 evenly. You could use a bar graph or pictograph. A pictograph would be best but a bar graph would work also.

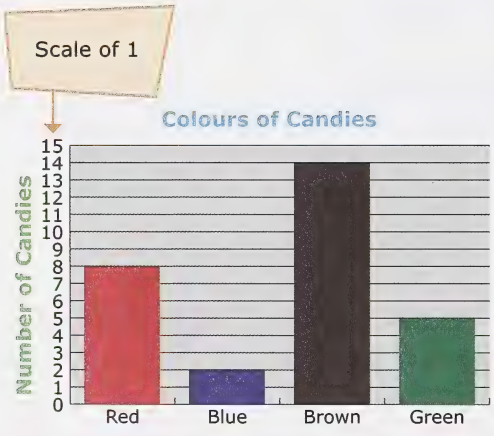
The type of graph should be the easiest to understand for the data. Remember, the whole point is to make the data meaningful.

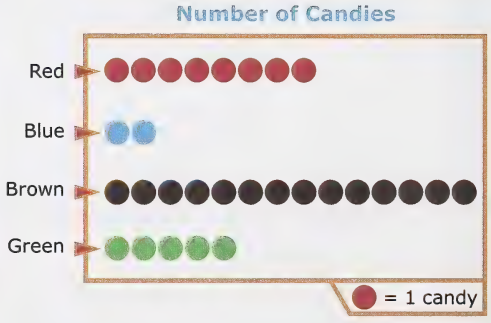
Go online to complete the Concept Capsule: Graphs, Graphs and More Graphs.

Changing Scales

The scale for an axis or a symbol depends on the size of the data. If the data is small numbers you can use a scale of one:

Colour	Number of Candies
Red	8
Blue	2
Brown	14
Green	5





If the data is larger you may want to change the scale:

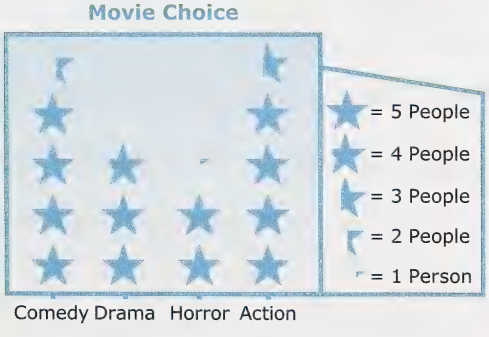
Age Group (years)	Number of Children
6 - 7	75
8 - 9	50
10 - 11	25
12 - 13	100

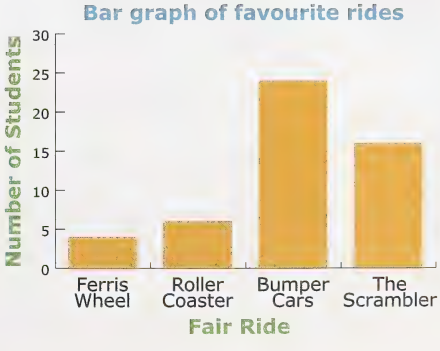
The scale on this graph was selected due to the size of each number.

Exploration 2: Changing the Scale

Materials: Unit 4, Lesson 1, Exploration 2 page from your Workbook, Pencil

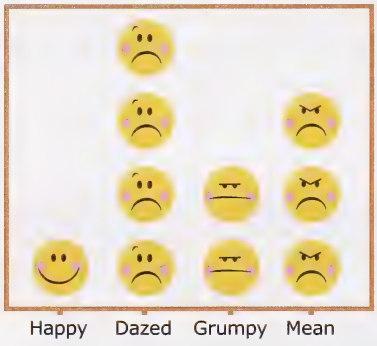
Look at these graphs again:

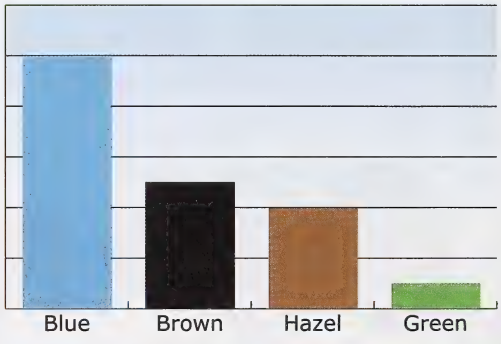




1. Why do you think the creator used a scale of "Star equals 5 people" for the pictograph?
2. What do you notice about the scale for the number of students on the Favourite Rides graph?
3. What is another scale you could use on the Favourite Rides graph?

These are graphs that represent a survey of 100 students:





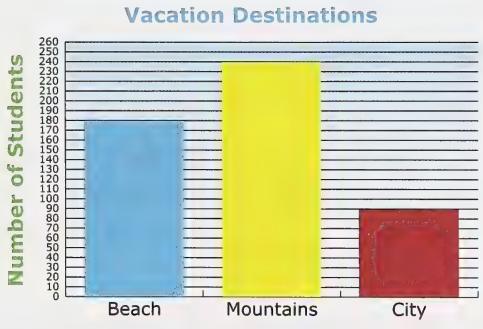
4. Write a survey question for the pictograph.
5. What would you use for a title on this graph?
6. What is the scale for each face in the graph if all together they represent 100?
7. Write a survey question for the bar graph.
8. What would you use for a title on this graph?
9. What is the scale for this graph if all together the bars total 100?
10. Reflect: What if there were only 10 students surveyed? How would that change the scale?

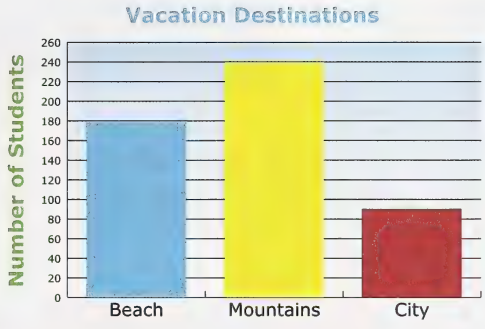
Example 2

What is an appropriate scale for a graph of this data?

Destination	Number of Students
Beach	180
Mountains	240
City	90

There is more than one way to find a good scale for large numbers. You can see that this data can all be found by multiplying a number by 10. The scale could be 10s: 10, 20, 30, 40... The numbers are really large so you may want the scale to be bigger. You may choose a scale of 20s: 20, 40, 60... You could even choose a scale of 30s: 30, 60, 90... Here are bar graphs of the data using both scales:





Possible answers are: scale of 10s OR scale of 20s

Reflection

Would it be appropriate to make the scale smaller? Would it be appropriate to make the scale larger? Why or why not?

Let's Practice

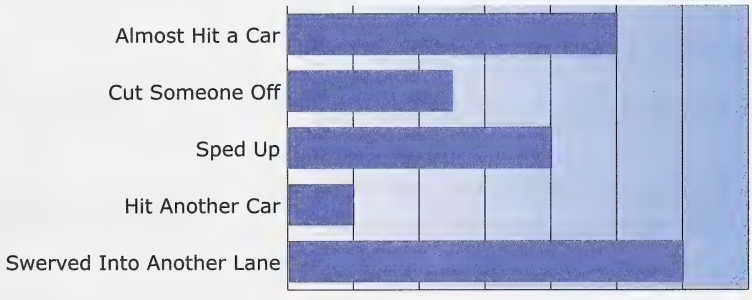
- In your Workbook go to Unit 4, Lesson 1 and complete 1 to 12.

Lesson 2

Creating Graphs

Gathering Information

Many people today are concerned about people who use a cell phone while they are driving. Here is a histogram from a recent newspaper article on cell phone use and driving.



You may use graphs like this one to gather information. You need accurate graphs that have all of the parts if you are going to get the right information.

Reflection

Could you explain the graph to someone? What is missing from this bar graph?

Objectives for this Lesson

In this lesson you will explore the following concept:

- Construction of bar graphs and pictographs for a set of data

Exploration 1: What's In the Box?

Materials: Unit 4, Lesson 2, Exploration 1 page from your Workbook, Pencil

Alyssa's mom put three toy boxes on the floor in front of the kids. She asked them to describe the contents of each box without looking.

To give them a hint she made these pictographs:

Toy Box 1

Toy Box 2

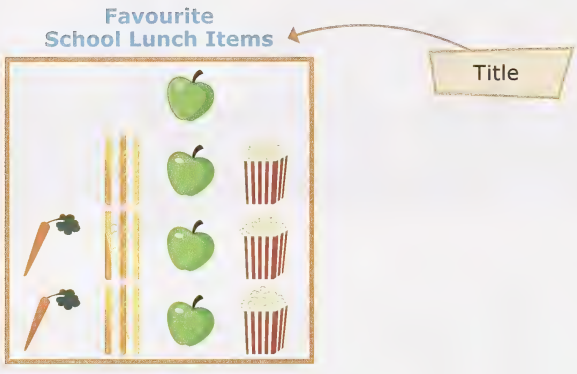
Toy Box 3

What is missing from these graphs? There are some missing parts to these graphs that would help you understand the symbols better.

1. What is missing from the pictographs?
2. What other information do you need?
3. Describe the contents you think are in Box 1. How did you get your answer?
4. Describe the contents you think are in Box 2. How did you get your answer?
5. Describe the contents you think are in Box 3. How did you get your answer?

Constructing Pictographs

To make a pictograph you will need to know the elements. Every pictograph should have a title. The **title** should give the reader the main idea of the meaning of the graph.



Example 1

A teacher surveyed her class. The survey question was:

"What is your favourite item for lunch at school?"

When she graphs the data, what can she use for the title of her graph?

It is best to keep a title simple. You don't want it to be too long. For this one don't use the whole question: "What is your favourite item for lunch at school?"

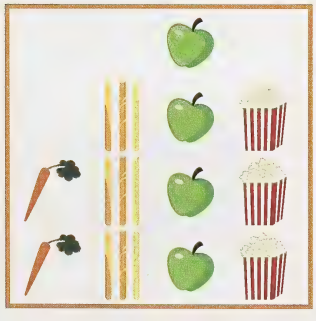
Narrow that down to what the question is about: "favourite school lunch item" or "favourite lunch" or "favourite school lunches"

You can use any of these as a title. The title should be capitalized like this: **Favourite School Lunch Items.**

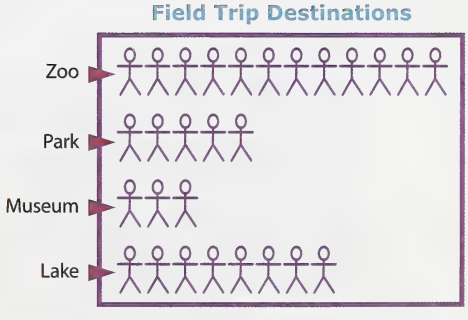
Another part of a pictograph is the **symbols** used for the graph. These are usually pictures. Sometimes they are simple shapes like circles or squares.

Some possible symbols:

You can use one symbol for all of the categories of the data. You can also use a different symbol for each category.

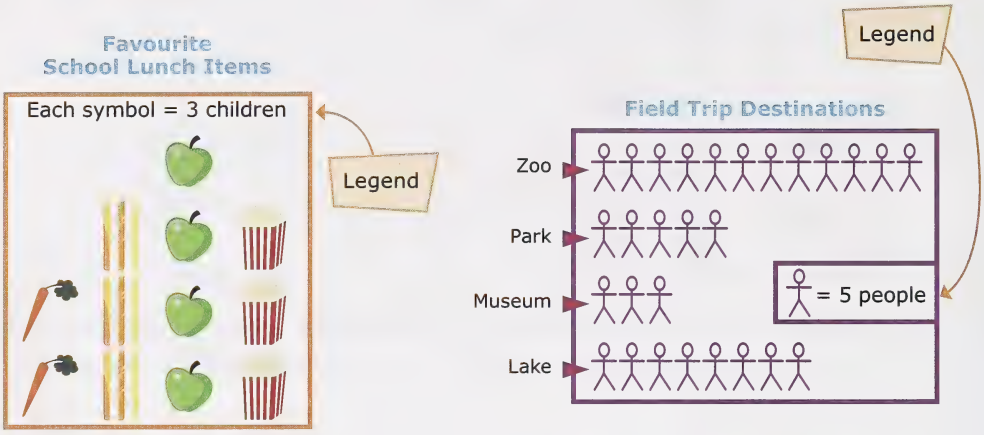


A Symbol For Each Category



The Same Symbol For Each Category

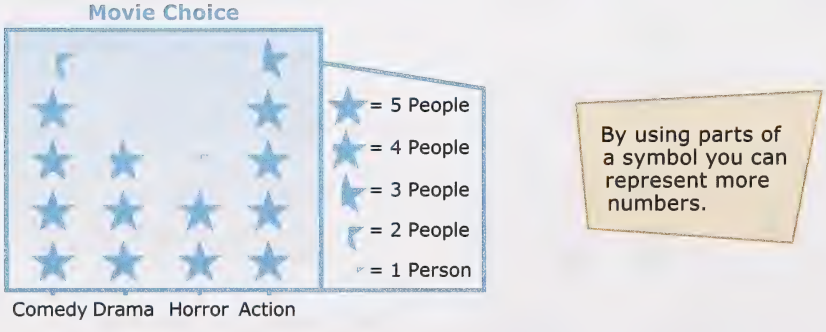
Once you have chosen a symbol for a pictograph you will need a **legend**. The legend will tell you the value of the symbol.



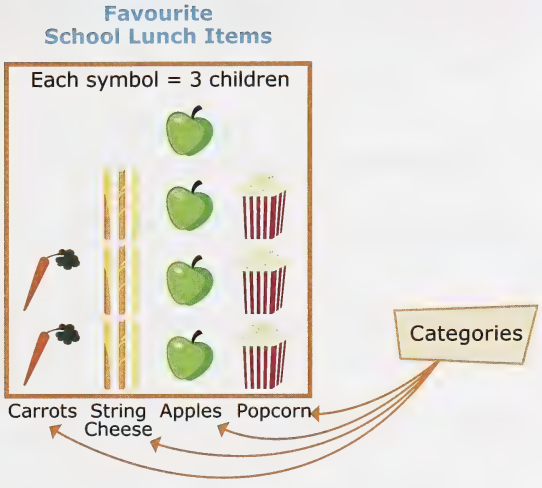
For the Favourite School Lunches pictograph, the symbols are different for each category so the legend says "each symbol" instead of drawing a picture of each.

Legends should also show the size of each symbol. In these samples the size of each symbol is more than 1. What if there were 53 people surveyed with the field trip question? That would mean that 3 people would be left over.

Some pictographs use half of a symbol:



Pictographs also need a label for **categories**:



These are the survey question choices for this graph. They may also be items in a group.

So remember, the parts of your pictograph:

- title
- symbols
- legend
- categories

Let's Explore

Exploration 2: Create a Pictograph

Materials: Unit 4, Lesson 2, Exploration 2 page from your Workbook, Pencil, Ruler, Pencil Crayons

You are surveying the neighbourhood about starting a community service project. One of your questions is:

Which group of people would you most like to help? (Choose one)

a. hungry

b. elderly

c. homeless

d. disabled

You are going to create a pictograph of the results. Your results are in the table shown:

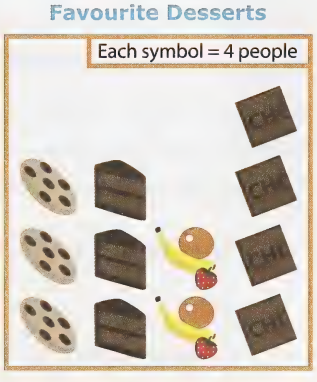
Group	Number of Votes
Hungry	45
Elderly	20
Homeless	75
Disabled	25

1. What would you use for a title?
2. What are your categories?
3. What will be your symbol or symbols?
4. What does each symbol represent? Be careful! Do you want each to represent 1 or more than 1?
5. Create your pictograph. Remember to include all parts of your graph.

Example 2

Daksha created the pictograph for the data shown.

Dessert	Number of Votes
Cookies	12
Cake	12
Fruit	8
Chocolate	16



What is missing from his pictograph that would make it easier to understand?

Think about the parts of the pictograph:

- Title: Daksha used an appropriate title for the data.
- Symbol: He used symbols that represent each category.

- Legend: The legend is in the pictograph and matches the data.
- Categories: The categories are missing. Without having them labelled the reader may think that the chocolates are just brown squares.

- In your Workbook go to Unit 4, Lesson 2 and complete 1 to 4.

Constructing Bar Graphs

Bar graphs should have most of the same parts as a pictograph. Instead of a legend, bar graphs will have a **scale**. The scale marks the length or height of the **bars**. This lets the reader find the value of each category.

The parts of a bar graph:

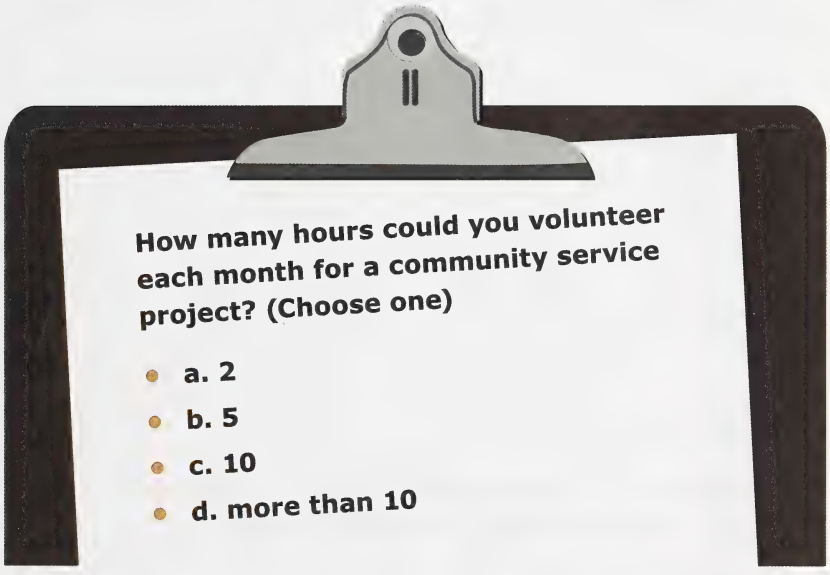
- Title
- Scale marked on side or bottom
- Categories
- Bars

Let's Build a Bar Graph!

Materials: Bar Graph Template from the back of this Unit in your Workbook, Pencil, Pencil Crayon

Let's make this one together! Use the bar graph template from your Workbook.

You are surveying the neighbourhood about starting a community service project. One of your questions is:

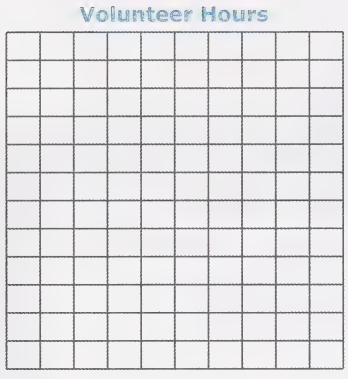


The results of this question:

Hours	Number of Votes
2	80
5	45
10	25
More than 10	15

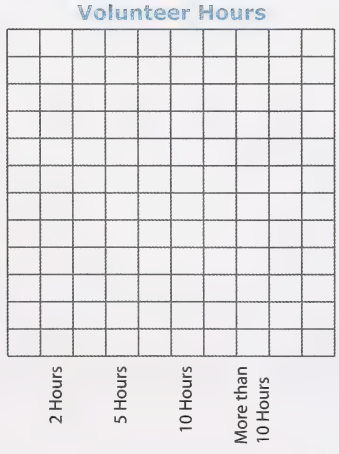
Select a Title:

For this sample use "Volunteer Hours". Put the title at the top of your graph.



Label the categories:

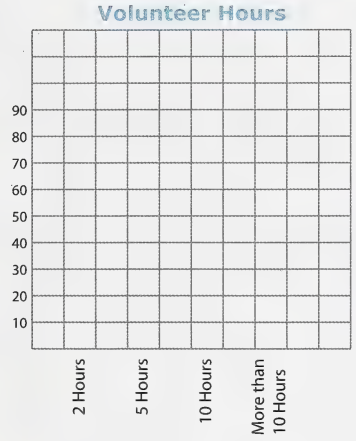
The categories will be the number of hours. Label them "2 hours", "5 hours", "10 hours" and "more than 10 hours".



Choose a scale:

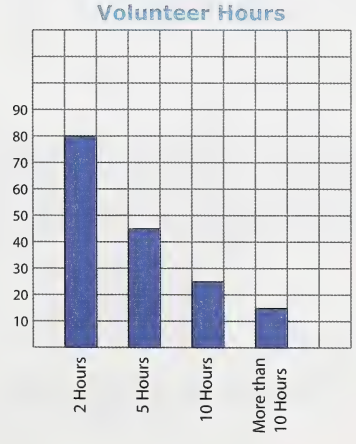
The numbers are really large. They can all be divided by 5, but even marking 5s will be hard since it goes to 80. You can use 10s. Half way between each mark will be 5.

Scale of 10: 10, 20, 30, 40...



Create the bars:

The bars must be the appropriate height. Use your scale to line them up:



You have built a bar graph!

Let's Explore

Exploration 3: Creating a Bar Graph

Materials: Unit 4, Lesson 2, Exploration 3 page from your Workbook, Pencil, Pencil Crayon

Lian went on a camping trip with her family. The data table shows what she collected on her week long trip.

Lian's Collection	
Item	**Number**
Snails	15
Pine cones	60
Fireflies	45
Rocks	50

Create a bar graph for the data, using the template on your Workbook page. Remember to label all parts. Clearly label the scale.

Let's Practice

- In your Workbook go to Unit 4, Lesson 2 and complete 5 to 8.

Go online to complete the Concept Capsule about Creating Double Bar Graphs.

Math 4

Glossary

A

addend: A number that is added to another in a group of numbers.

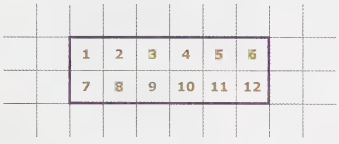
2 + 4 = 6

The numbers 2 and 4 are addends of the sum.

analog clock: A clock that has numbers or marks representing the numbers, and hands that move around the centre.

ante meridian: Time from midnight to just before 12 noon. Labelled AM.

area: The number of square units it takes to cover a shape.



arrays: An arrangement of objects in rows and columns.

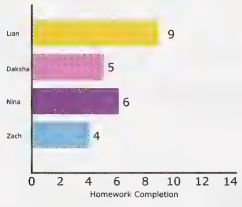
3 by 6 array with 3 rows and 6 columns

attribute: A characteristic or trait of an object or number.

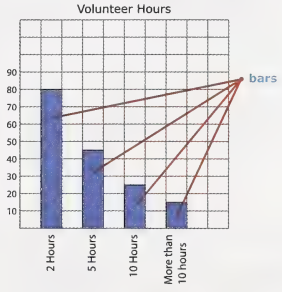
10 is an even number. Even is the attribute.

B

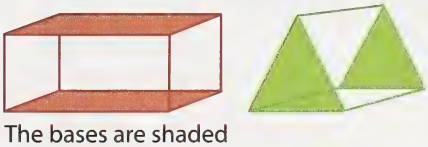
bar graph: A graph that displays data with bars that represent values.



bars: A rectangle that is used to represent numbers on a bar graph or a histogram.

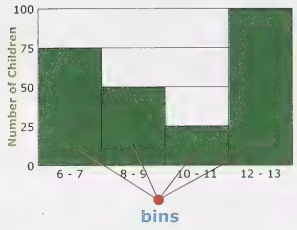


base: The two faces of a prism that are congruent and parallel.



The bases are shaded

bins: The columns of a histogram that represent an interval for the data.

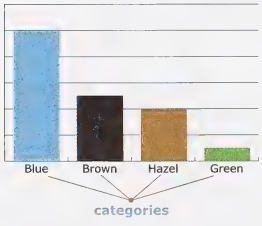


C

Carroll diagram: A diagram used for grouping elements of a set using yes or no answers.

	125 cm or more in height	Not 125 cm or more in height
Girl		
Not a girl		

categories: Each type of object or data that are being recorded.

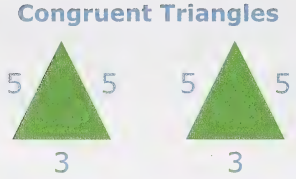


centimetre square: A square that has each side measuring 1 cm.

compatible numbers:
Compatible numbers are numbers that are close to the original numbers in the problem.

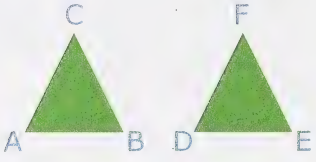
127 + 238
= 130 + 240
= 370

congruent: Figures that are the same size and shape.



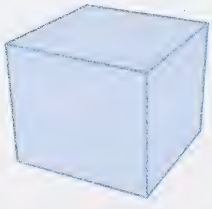
consecutive: Two numbers that follow each other in order.
2 and 3 are consecutive numbers in the set: {1, 2, 3, 5, 7, 9}

corresponding parts: Angles and sides that have the same position in congruent figures.



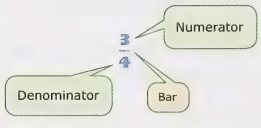
angle A corresponds to angle D
side AC corresponds to side DF

cube: A prism that has bases that are squares.

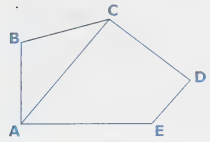


D

denominator: The number in a fraction that is below the fraction bar. It represents the total number of items in a group.



diagonal: A line joining two vertices of a shape.



AC is a diagonal.

distributive property: The property that states that multiplying a number by a sum is the same as multiplying a number by each number in the sum.

Multiplying by a sum	Multiplying with Distributive Property
$4(15 + 8)$	$4(15 + 8)$
$= 4\ (23)$	$= 4\ (15) + 4(8)$
$= 92$	$= 60 + 32$
	$= 92$

dividend: The number being divided in a division problem.

$$6\overline{)84}\quad 14$$

Dividend

divisible: If a number can be divided by another number with no remainder then it is divisible by the second number.

$12 \div 3 = 4$

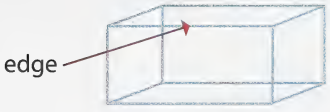
12 is divisible by 3.

divisor: The number you are dividing by in a division problem.

Divisor → $6\overline{)84}\quad 14$

E

edge: A line segment where two sides come together.



elements: Members of a set.

7 is an element of the set: {1, 3, 5, 7}

equation: A math sentence that shows two quantities are equal.

$3 + x = 8$

F

face: The flat side of a prism.

A face is shaded.

face clock: A clock that has numbers or marks representing the numbers, and hands that move around the centre.

fraction: A number that names part of a whole or a group.

$\frac{2}{3}$ 

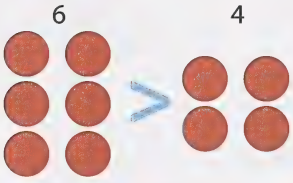
$\frac{2}{3}$ 

front-end estimation: The addition of only the largest place value digits.

456 + 328 = 400 + 300 = 700

G

greater than: The > symbol shows that two numbers are not equal.The number in front of the symbol is greater than the number after the symbol.



H

histogram: A graph that displays data in intervals.

6 – 7 years is an interval.

horizontal: A line that extends left and right.

I

identity element: The identity element is a number that when any number is added, subtracted, multiplied, or divided by the identity, leaves the answer unchanged.

Identity for Multiplication: 1
12 x 1 = 12

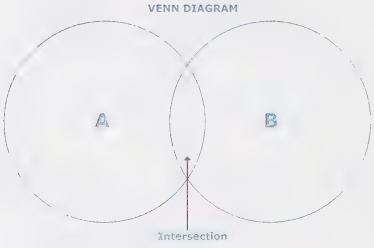
Identity for Division: 1
7 ÷ 1 = 7

Identity for Addition: 0
8 + 0 = 8

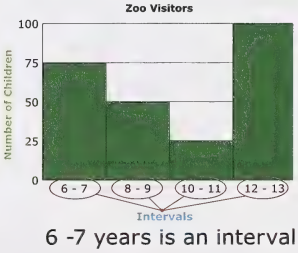
Identity for Subtraction: 0
10 - 0 = 10

inequalities: Two expressions that are not equal. The symbols <,>, and ≠ are used to show an inequality.

intersection: The overlapping part of a Venn Diagram.



interval: The range of a set of data.



6 -7 years is an interval.

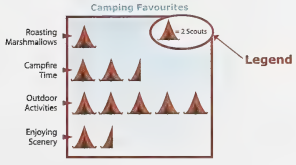
inverse: Operations that undo each other. The inverse of addition is subtraction. The inverse of multiplication is division.

Subtraction is the inverse of Addition:
5 + 9 = 14 14 - 9 = 5

Division is the inverse of Multiplication:
5 x 3 = 15 15 ÷ 3 = 5

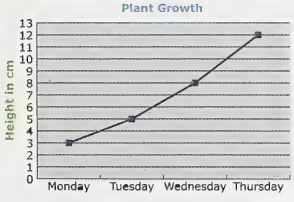
L

legend: A description of the symbols used in a graph.

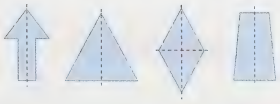


less than: The < symbol shows that two numbers are not equal. The number in front of the symbol is less than the number after the symbol.

line graphs: A graph that shows values over time.



line of symmetry: A line that shows where a figure has symmetry.



linear: Measures that involve a straight line.

The perimeter is 12 units. This is a linear measure since it involves measuring straight lines.

logic: A thought process used to solve problems.

long division: A process for dividing two numbers using steps written out in full.

$$\begin{array}{r} 14 \\ 6\overline{)84} \\ \underline{6} \\ 24 \\ \underline{24} \\ 0 \end{array}$$

M

multiplier: A number that another number is multiplied by.

3 x Δ = 21

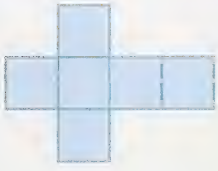
3 is the multiplier

N

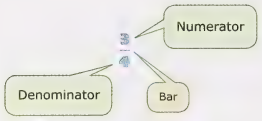
net: A 2-D pattern that can be folded into a 3-D figure.

Cube

Net of the Cube



numerator: The number above the bar in a fraction. It describes the number of parts of the whole.



O

operation: In math there are four basic operations: add, subtract, multiply and divide.

Four basic operations:
Addition +
Subtraction -
Multiplication x
Division ÷

P

pattern: A set of numbers or objects that follow a rule.

2, 4, 6, 8, 10

pentagon: A five sided polygon.

perimeter: The distance around an object.

The perimeter is 3 + 4 + 5 or 12 Units

period: A group of 3 digits. Each period is separated by a space in a standard form number.

Period	Thousands		Ones		
Place	Ten	One	Hundred	Ten	One
Value	10 000	1 000	100	10	1

pictograph: A graph that displays data with picture symbols.

post meridian: Time from noon to just before 12 midnight. Labelled PM.

prime number: A number that can only be divided by itself and 1.

Prime: 3
Not Prime: 6

Q

quotient: The answer in a division problem.

Quotient → $6\overline{)84}$ = 14

R

rectangular prism: A 3D shape that has bases that are rectangles.

relationship: A description of how one number can be used to find another number.

A	1	2	3	4	5
B	3	6	9	12	15

The relationship of A to B is to multiply A by 3.

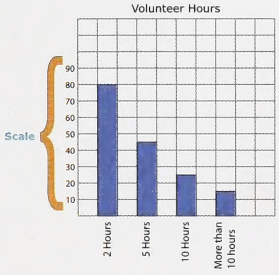
rule: A statement that describes a pattern.

2, 4, 6, 8, 10

Rule: Add 2

S

scale: The markings on a graph to show value.



set: A collection or group of objects or numbers.

{ red, blue, green yellow }

square pyramid: A three dimensional shape that has a pointed top and a square bottom.

standard form: A number written with spaces between periods.

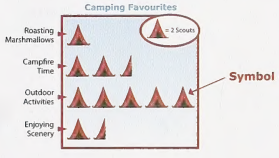
The number one thousand two hundred forty-three is: 1 243

Thousands	Hundreds	Tens	Ones
1	2	4	3

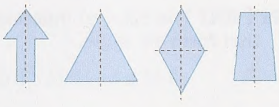
symbol: A shape or icon used to replace a word or a number.

Instead of saying divide we use the symbol: ÷

symbols: Pictures or shapes used to represent numbers on a graph.

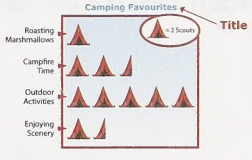


symmetry: An object is symmetrical when one half is a mirror image of the other half.

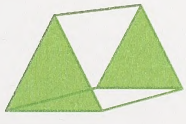


T

title: The heading for a graph.



triangular prism: A 3-D shape that has bases that are triangles.



U

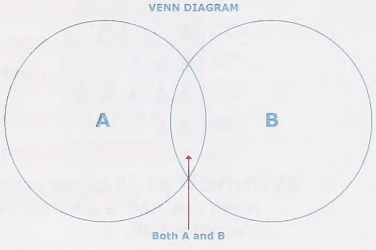
unknown value: A number that is unknown in an equation or expression.

$3 + x = 8$

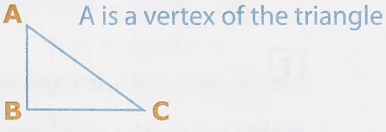
x is an unknown value.

V

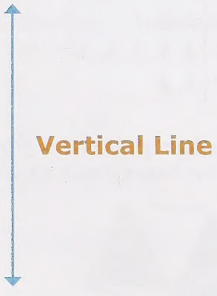
Venn diagram: A diagram that visually shows how sets are related.



vertex: The point of meeting of lines that form an angle.



vertical: A line that extends up and down.



Z

zero property of multiplication: A property of multiplication that states that multiplying any number by 0 will give a product of 0.

$124 \times 0 = 0$

$76 \times 0 = 0$

$0 \times 560 = 0$

ISBN 978-0-7741-3062-2